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The

Electrical Review

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Bankruptcy.

NO electrical or allied business can hope to conduct its operations efficiently unless it has some shrewd member of its staff always alert, watching for signs of financial weakness in somebody else.

If such a matter is left to chance, it is practically certain that bad debts will mount up to a considerable figure in a short space of time. If this item in a year's accounts exceeds a moderate percentage, it is a mark of business inefficiency or incompetence as a rule. Sometimes it is caused by want of thoroughness on the part of the information department, but it is, of course, recognised that there are exceptional trade losses against which the best detective agencies in the world cannot safeguard us.

No business can be done without risks being run. At times they are deliberately undertaken—indeed, where would trade be possible at all if faith were not the basis upon which transactions rested? But is it not frequently the case that unnecessary risks are run?—and if so, why is it that the machinery available for the diminution of such risks is not more freely utilised than it is?

There are various sources from which status information may be obtained—the regular trade reader knows the various sections of this journal in which we have always made a practice of publishing official reports and records which will guide him. Generally speaking, it is useful to watch the returns regarding capital issues and debentures as found in the official records; there are the established inquiry agencies; there are the frequent county court appearances; there are rumours in the usual circles and hints dropped in over-coffee conversations; and there are signs which are recorded nowhere save on the fallen countenance of an accustomed client.

In opening new connections, recourse is had to trade and banking references and inquiries regarding general standing and reputation, and remittance with first order may be obtained, but everybody knows that all such efforts or measures fail sometimes; even the cash given with first order disarms the supplier on the second and third occasions. We think that the business community should consider whether, now that the turnover of electrical trade has reached such enormous proportions, the existing information-seeking facilities are as complete and efficient as they might be made. It might well be found that some specialised service could be established (perhaps linked up with existing agencies) expressly for the electrical and engineering trades.

Much of our space devoted to business matters has been occupied of late with failures of comparatively small companies and firms. Not many of the failures that occur are due to roguery and trickery. Incompetence and inexperience; want of sufficient capital at starting; ill-health occurring in a business where there is no competent substitute; bad or ill-timed buying of stocks when reliable knowledge of markets would have warned of a slump in prices; the failure of another party to fulfil his obligations; the acceptance of debentures in settlement of over-due debts; believing the word of those who avert or defer their own disaster for a time by prevarication and by making promises which fail to mature; undercutting and over-glutting—these are some of the many causes which our readers will have noted from time to time. Adverse trade winds, wireless delay, and trade disputes have of later caused weakness and uncertainty for many, and some of the foregoing circumstances or excuses have been adopted as the direct result thereof.

If the electrical trade had a representative commercial organisation, it might do much good work in assisting itself against such weaknesses as we have indicated. There are possibly some sections which are already well provided for in this respect.

There is another aspect of the matter with which we wish to deal briefly, in view of the frequency of failures recently. There is good reason for believing that many failures have to be recorded of competent, well-meaning, and honest men who have fallen on bad times; men who might get on to their feet again if they were given time or if assistance were forthcoming through the medium of some special organisation. Under certain circumstances, when the real facts of the situation were investigated by an independent body, it might be possible for supplies to be conditionally continued and even financial help might be given in some cases under specified terms. It might be desirable to keep some weak concerns alive, a small assistance saving a bigger loss; in other cases it might be for the good of everybody if their disappearance were hastened. Of course, the bolstering up of concerns which would be likely to indulge in cut-throat and profitless competition could not be thought of for a moment. Perhaps there would be a fear that competitors would get to know too much about the business which had temporarily fallen on evil times, but this and many similar considerations are for purely business men to deal with and safeguard against. All we wish to do is to suggest that something might be done in the interests of the industry as a whole.

Assuming it to be desirable that something should be done to enable electrical firms, whether manufacturers, contractors, or traders, to avert failure of business eventuating in bankruptcy or liquidation, how far is it practicable to do so?

First, with regard to desirability. The time involved in, and the cost of, following up threatened or actual failures are considerable, and the yield from the efforts and expense thus incurred is meagre in the extreme. The trade is saddled with bad debts swollen by legal and other incidental charges, and men go out of business under a stigma whether the fault is their own or whether they are the victim of circumstance which is utterly devoid of sentiment or consideration for the man who cannot pay his way. Is it desirable to help a man (or a firm) to save himself, or are we to take up the attitude that there is an inevitable course and fate for the unfortunate, and that Nemesis stalks relentlessly and will not be diverted? Must the weakest always go to the wall regardless of whether the weakness could or could not be avoided and without any effort being made to build up—not bolster up—the strength of the man whose record and reputation merit assistance?

Possibly some of our readers to whose practical knowledge and experience we make appeal in connection with so purely commercial a matter, may imagine us to be visionaries groping about for a Utopia for the business world because we ask such questions, but, as we have shown, we are by no means ignorant of the incompetence, foolishness, recklessness, lack of foresight, and other failings which bring men to commercial confusion. And we are not asking whether anything should be done to save men, in spite of themselves, from the consequences of these failings or from roguery, trickery, chicanery, or to assist to prolong their inclusion in the ranks of electrical traders. There are many misfortunes which men cannot foresee, and it is from the usual consequences of these upon the victim himself and those who stand to lose as creditors that it might be possible to afford protection. Rogues and sharp schemers can be dealt with—if caught, and if they do not just manage to steer clear of culpability under the law. There are some of them who are rogues deliberately of their own choice; some become delinquents in the course of their efforts to stave off the inevitable; but there are more who are creatures of circumstance.

There is in existence across the Atlantic what is known as the Associated Dress Industries of America. It was formed for the purpose of rendering assistance to honourable men who had struck a "bad patch," and who felt that they were "not headed right," or who saw embarrassment staring them in the face. The organisation invites such men (retailers) to put confidence in it and make a clean breast of their difficulties. It does not at once ask the unfortunate man how much money is required to help him over the emergency, and find it forthwith. First of all, it investigates his affairs; later he is asked to call and lay his cards on the table without reservation. If his story and his facts prove to be correct, the organisation takes action and handles the case on its merits. The co-operation of creditors is sought; they are asked to hold their hands—not to act individually pressing their claims; co-operatively they may give an extension of time to clear indebtedness, continue to give reasonable credit, supply with goods up to a specified amount. It is sometimes possible to guarantee payment of the additional credit granted. The local banker may be conferred with; creditors may perhaps provide expert advice and assistance in the running of the business, and gradually the tottering business may be developed into a progressive and profitable one.

It is not for us to advance cut-and-dried schemes. We think, however, that this scheme for dealing with one American trade is worthy of study, in case it may be found to point the way for other trades. We are content in this case if we have put forward an idea that members of the electrical trade may discuss together. We have heard a good deal about the weak position of electrical retailers. May it not be that there is something in the above suggestion which may bear at any rate upon one small part of that very troublesome matter?

The I.E.E. Dinner.

THE annual dinner of the Institution of Electrical Engineers on Thursday last week passed off with the usual success. Why other bodies do not follow the example of the I.E.E. in cutting short the oratory and thus allowing time for a most pleasant social reunion we have never been able to understand; the advantages of that procedure are obvious, and there can be no doubt that the members appreciate the practice.

We would join Viscount Chelmsford in congratulating Dr. Russell on his election to a Fellowship of the Royal Society, almost the highest distinction that science can offer its votaries. His work is not so well known as that of some other scientists, owing to its somewhat abstruse character, but of its great value there is no question, and it is gratifying to add that it has been carried out mainly in connection with electrical engineering.

For the second time Dr. Russell referred to Mr. W. E. Highfield's "transverter," and we gather that particulars of that rather mysterious creature will be made public in the near future; electrical engineers will look forward to the revelation with keen interest.

Sir Ernest Rutherford also foreshadowed further revelations, with reference to the structure of that "fine piece of electrical machinery"—the atom—of which he has taught us so much; "fine" it is, in a double sense, but in spite of its minute dimensions it has already proved of immense importance to electrical engineers, and it is probably destined to exercise a supreme influence over the future of electrical science. Sir Ernest took the opportunity of reminding his audience that they owed their livelihood to the discoveries of academic workers in pure science, on whose behalf he invited their support. There is a constant danger that too much attention will be given to industrial development research, and that pure scientific research will be neglected; we should like the Department of Scientific and Industrial Research to recognise this tendency and to do much more to promote the former of its objects than it has hitherto done, for scientific investigation lays the foundation upon which industrial research erects the building—and unless the foundation is well and truly laid, the building cannot endure.

Power-station Practice.

In our following pages an article by Mr. John Bruce is begun, which supplements his article in our issue of January 4th on turbo-alternator tests. To say that it is in the boiler room that economies can be effected is a platitude, but the fact is none the less important on that account; it cannot too often be emphasised, and no subject connected with the generation of electricity will more amply repay careful and assiduous study.

The author shows what data are required, and how they should be obtained; he also indicates some of the uses to which they can be put—and it is of the first importance that they should be not merely recorded, but correctly interpreted and utilised for the guidance and instruction of the staff. An excellent method of using them to the best advantage was described by Mr. R. H. Parsons in our issue of February 21st, 1919, whereby the actual position of the undertaking as regards economy of fuel can be gauged from day to day, with the minimum of computation, and this system, we believe, is actually in use at Dalmarnock power station, where it has been found extremely useful. The system, however, is not restricted to the largest power stations—it can be applied elsewhere with advantage, and we recommend station engineers who have not yet examined it, to take the first opportunity of doing so. Properly applied, it is an invaluable aid to economy; and it is not subject to any royalty.

London's Traffic.

Lord Ashfield's statements regarding the London traffic problem at the annual meeting of the "Underground Group" afford much food for thought. He showed that whilst the number of passengers carried had increased by 15 per cent., the gross traffic receipts had diminished, the average receipt per passenger having fallen by 14 per cent. This result was chiefly due to the reduction of omnibus fares to about 1d. per mile; the railway traffic decreased by 20 million passengers (about 6 per cent.), whilst the omnibuses carried 193 million more passengers (about 23 per cent.), and the number of omnibuses owned by the Group increased from 2,809 to 3,869. Co-ordination of traffic on the tramways, railways, and omnibuses has been abandoned, and the Group is still increasing its fleet of 'buses at the rate of 25 a week.

Lord Ashfield stated that the average speed of street traffic in London had fallen from the pre-war value of 8 or 9 miles an hour to 4 or 5, as the result of filling the streets with streams of omnibuses, and the relief that could be afforded to the surface traffic by the use of the underground railways was not secured.

These regrettable results are largely due to the absence of a traffic controlling authority in London; that want has been felt for years and years, and the failure to fill it reflects discredit on Parliament, which has repeatedly been told by Royal Commissions that such an authority is imperatively necessary, but has ignored their advice. No one who lives and moves in London can fail to observe the extreme congestion of traffic at many important crossing places, whereby the pace of the whole is slowed down. Sir Alfred Yarrow has offered to construct an elevated crossing for experimental purposes, but this is not a sound remedy for the evil, but only a palliative. The crying need is for a controlling authority which will deal with the whole problem drastically and efficiently.

Electricity in Agriculture.

No happening connected with the use of electricity in agriculture escapes the eye of Mr. R. Borlase Matthews, our leading if not our only electro-farmer, who keeps our readers well informed with regard to the latest developments in this subject. His account of the agricultural show recently held in Paris, when compared with the report of an English agricultural show, reveals a wide contrast in respect of the utilisation of electricity in the two countries. The mere fact that 350 electric motors were in use at a show comprising some 400 exhibitors itself indicates that our friends across the Channel have a very different conception of the possibilities of the electric drive from that which obtains amongst British farmers—if, indeed, the latter have any ideas on the subject at all. Granted that many of the motors in question were merely used for showing other machinery in motion, the fact remains that they were very freely used, and the variety of apparatus that was exhibited in which the electric motor formed an integral part proves that in France the adoption of electricity for agricultural purposes has reached a stage very far in advance of anything that we can show—except at Greater Felcourt Farm.

To promote similar progress in this country three things are necessary: a supply of electricity on the farm, the provision of suitably designed apparatus, and—publicity. For the first two conditions we must look to the electricity suppliers and plant manufacturers; for the third we hope E.D.A. will make itself responsible, and we are glad to know that at the British Empire Exhibition there will be a comprehensive exhibit of electrical farming apparatus, organised by Mr. Matthews under the ægis of E.D.A. We believe that it will be a revelation to a large number of visitors from the country, and we hope that it may result in stimulating them to demand the fulfilment of the two conditions first named above.

Imperial Wireless Telegraphy.

We read with pleasure, in the daily Press, that the Committee appointed by the Postmaster-General to investigate the circumstances which have culminated in a deadlock between the Marconi Co. and the Post Office has already drawn up its report, which will shortly be published. It is hinted that the Committee recommends the operation of the Imperial station in this country by the Post Office Department, but that wireless communication with foreign countries will be left in the hands of private enterprise. Whatever the decision, it will be welcomed by the trading community if it be a decision that will accelerate the provision of adequate facilities for communication with oversea countries.

Boiler-Room Practice.

By JOHN BRUCE, A.M.I.E.E.

It is now generally recognised that a boiler plant can only be efficiently and scientifically operated if means are provided, in the form of modern boiler-room instruments, for the purpose of informing the boiler-room operatives when changes towards inefficient conditions of operation are taking place, the effect of such changes, and what counteraction is necessary to maintain the correct operating conditions for maximum efficiency. Increased efficiency, or a saving in fuel and a cheaper production of steam, can only be attained provided the installation of instruments is given the same careful consideration as that bestowed upon the purchase and installation of the other sections of power station equipment. This is a point which, as yet, is not as fully realised as it ought to be; nevertheless there are good grounds for predicting that the time is not far distant when every boiler unit will be compulsorily equipped, not only with steam pressure and water gauges, but with the necessary instruments for scientific control in addition.

Often in the past, an instrument has been purchased and installed on a boiler unit or boiler plant, and no thought given to whether it was the type of instrument best suited for the duties required of it, or whether it was connected to the correct point in the gas, or other, circuit. As a rule, after the first flush of enthusiasm was over, the apparatus was left very much to itself; and deprived of the necessary attention, it soon ceased to function correctly, the usual result being that the whole outfit was unjustly condemned. Further, there are other instances of instruments having been installed and because, due to that fact, the operating efficiency did not immediately show a gratifying increase, condemnation of the equipment followed. It did not seem to be realised that some co-operative endeavour was required on the part of the human element. The failure of boiler-room instruments in the past was, in a certain measure, due to the engineers themselves, the staff in many generating stations being more "electrical" than "mechanical" or "chemical," and the functioning of the instrument and its purpose in the boiler-room were only vaguely understood. In the large modern power station, however, mediæval methods have been discarded, and the boiler-room is now operated by properly-trained combustion experts, who can control the steam generating equipment from the indications of scientific instruments, as easily as the switchboard operator controls the load on the generators.

Before an instrument equipment is installed there are certain points to be considered, the most important of which, in the present writer's opinion, is the human element. Each member of the firing crew must thoroughly understand that his whole-hearted co-operation is necessary if the interpretation of the instrument indications is to lead towards the desired result. He must be taught the functions of the various instruments, the meaning of their indications, and how and why these indications show what is required to be done, how it is being done, and whether it is being done correctly.

Boiler-room instruments must be looked upon with respect by everyone. They are scientific tools, their purpose being to assist the operating staff in their work, enabling fuel and equipment to be used more economically and advantageously, resulting in a saving of money and effort. Possibly, after an equipment of instruments has been installed, the interpretation of their indications may show that methods, considered in the past essential to efficient operation, are in reality wasteful and expensive, and it is in the breaking of old habits that the average fireman shows a reluctance to adapt himself to the changed conditions.

It is difficult to state definitely the minimum equipment of instruments necessary for scientific boiler-room control, but this point, in the majority of cases, is usually governed by financial rather than technical considerations. Usually, the extent of the instrument equipment will depend upon the size of the boiler plant, though in the opinion of the writer, each boiler unit should be equipped, no matter what size the plant, with its own outfit of apparatus, so that either a continuous indication or a record will be given of the performance of each separate unit. Further, it is difficult to control and operate in an efficient manner a battery of boilers steamed as one unit.

The amount of instruments required will also be governed by the extent of the operating information considered necessary. The trained combustion engineer will be able to tell from the instrument indications whether the plant is being operated as efficiently as it could be, but he can only tell approximately what results are being obtained, and naturally he desires some sort of permanent and comparative record of performance. Even with the most modern outfit of boiler-room instrument apparatus, including automatic coal weighing or measuring machines, and apparatus for the automatic analysis and recording of flue gas constituents, it is commercially impossible under the every-day operating conditions of the average station, to accurately determine and tabulate every item in a detailed heat-balance statement at the end of each twenty-four hours. Therefore, when deciding on an installation of instruments, careful consideration should be given to what is considered necessary information, and the use to which such information can be put.

To be able to operate any plant successfully from an interpretation of instrument indications and results of performance, it is desirable at least to know:—

(1) The amount and rate per hour of coal consumption, in terms of weight, preferably for each grate and for any desired period of time.

(2) The calorific value of a sample of coal representative of the average size and quality of that consumed during a definite period.

(3) The percentage of the total coal fed to the furnaces which appears in only a partially consumed condition in the ashes discharged. This item is usually calculated on the assumption that the unconsumed portion is carbon, and is reported as combustible in ash.

(4) The total water, in pounds, evaporated from or fed to the boilers for any period of time, and preferably, in addition, an indication of the rate of evaporation, in pounds per hour, from each unit. The apparatus indicating rate of flow serves a purpose somewhat similar to that of the ammeter of a generator.

(5) Conditions of pressure and temperature of steam, and temperature of feed-water entering economiser and boiler. Preferably, this information should be available for each unit.

(6) Carbon-dioxide content of flue gases and the temperature of the gases at various points of the gas circuit. It is desirable that the CO_2 determination be made on a sample of the gases drawn from the last gas pass of each boiler, and that the gas temperatures be measured on each unit, at the last gas pass, superheater, and inlet and outlet of economiser. The ordinary types of instrument which only indicate or record the percentage of the carbon-dioxide content of the flue gases, give no indication of the critical point of combustion, and the recently developed absorption and electrical types of automatic gas analysing and recording apparatus, which

in addition to the CO_2 constituent, give also a record of CO, H_2, CH_4, &c., are to be preferred.

(7) The difference of pressure between that of the atmosphere and that existing in the gas circuit, in other words the draught, at various points on each unit from the air ducts below the grates to the stack, and in addition, the pressure difference in the gas circuit between two definite points on each unit. Preferably the smaller pressures and pressure differences, such as those in the neighbourhood of and across the firebed, should be measured by gauges of the inclined leg type.

Considering the items enumerated above, 2 and 3 can only be determined provided the engineer is supplied with the necessary laboratory apparatus, but quite a respectable outfit can be obtained for a moderate expenditure, and further, there is no reason why laboratory equipment should not be considered part, and an important part, of the instrument installation. The remainder of the detailed items can all be determined to quite a respectable degree of accuracy by means of modern boiler-room instruments. It is not intended to deal in this article with the various types of instruments for the different determinations that are necessary, but in passing, it should be stated that apparatus supplied by any of the well known and reputable manufacturers will give reliable service provided the installation is given the necessary attention for upkeep and repair.

Apparatus for the measurement of the weight of coal consumed, and preferably indicating the rate of flow in pounds per hour through each grate, is, or at least should be, considered indispensable. Coal metering apparatus of the volumetric type for chain-grate stokers has been developed to a high degree of reliability and acceptable accuracy, and can be readily adapted to indicate rate of flow. In plants of any size the coal consumption of each grate should be under continual measurement, and the rate of flow either indicated or recorded. Then, if the boiler unit is equipped with steam flow meters indicating the evaporation in pounds per hour, the operating staff have, by a reference to the rate of flow of coal and rate of evaporation, a ready means of information of the approximate efficiency being obtained.

In generating stations where a periodic and systematic check is kept on the coal consumption, it is the usual practice to arrive at the weight of coal consumed by subtracting, from the last readings of the various coal-metering machines those readings taken at the end of the preceding shift, or other period, as the case may be. The result thus obtained is checked by subtracting the totals of all the integrator readings. In a large station, in which possibly as many as 50 coal weighing or metering machines are used, much unnecessary calculation and book-keeping would be avoided if each piece of metering apparatus was equipped with a push-button trip mechanism for resetting the integrator to zero at the end of each period.

Where chain-grate stokers are used, and the output of each boiler unit is indicated by flow meters, even if no coal metering apparatus is installed, it is a simple matter to provide the operating staff with a guide to the efficiency of the unit, and to show in a comparative form, at any instant, the results obtained.

This can be accomplished in the following manner:—The fire or guillotine door of each grate is adjusted to correctly register with the height, *i.e.* fire bed thickness, usually indicated on the rack on front of the stoker. That done, the rate of flow of coal per hour in cubic feet is determined for different combinations of fire bed thickness and grate speed. The average weight, in pounds per cubic foot, of the coal usually used is next determined, and from this and the data already calculated it is a simple matter to arrange in tabular form a statement for each individual grate showing the coal consumption per hour at different grate speeds, and for the range of fire-bed thicknesses usually carried in daily operation.

The next job is to determine the best, or average output, as the case may be, registered by the flow meters, for different grate speeds and fire bed thickness, and this figure is then entered as an item in the aforementioned statement, against the grate speed and fire bed thickness at which that particular output was obtained. In this manner the boiler room operating crew have a standard of efficiency to work to and, moreover, one which they have set up for themselves. Fig. 1 shows a

No. 2 Boiler-Room.
Babcock and Wilcox Chain-Grate Stokers.
Boilers No. 9, 10, 11, 12.

Approximate Coal Consumption, and Boiler Output as Indicated by Flow-Meters, Pounds per Hour. For a given Rate of Coal Consumption, the Boiler Output as Indicated by Flow-Meters should not be less than the Value shown in Table below.

Grate Speed.		Approximate Coal Consumption, Pounds per Hour.					
Speed No.	Feet per Hour	4·0 inch Fires.	4·5 inch Fires.	5·0 inch Fires.	5·5 inch Fires.	6·0 inch Fires.	6·5 inch Fires.
1	9·5	—	—	3260 Flow Meter 20000	3550 Flow Meter 22000	3850 Flow Meter 24000	4170 Flow Meter 26000
2	18·3	4960 Flow Meter 31500	5580 Flow Meter 35500	6190 Flow Meter 39500	6800 Flow Meter 44000	7410 Flow Meter 48000	8050 Flow Meter 52000
3	27·7	7500 Flow Meter 48500	8430 Flow Meter 55000	9360 Flow Meter 62000	10290 Flow Meter 68000	11220 Flow Meter 74000	—
4	38·5	10540 Flow Meter 68500	11660 Flow Meter 77000	—	—	—	—

Note:—Flow Meter Output is based on the following Conditions. Steam Pressure, 270 lbs per □ in. g. Steam Temperature 700°F. Calorific Value of Coal as Fired, 10300 B.T.U's per lb. Temperature of Feed-Water, 142°F. The Boiler Output Indicated in the above Table will therefore be affected by Variations in any of these Conditions.

Fig. 1.—Table of Coal Consumption and Boiler Output.

table of grate speeds and coal consumption with the corresponding boiler output as registered by flow meters, determined in the manner described. It will, of course, be understood that such a table can only be approximate, since the values will be influenced by variations in the quality of the coal, conditions of steam pressure and temperature, feed-water inlet temperature, and the state of the heating surfaces. The table, when completed, should be framed and hung in the boiler room in a position where it can be readily referred to.

In the sampling of flue gases for the estimation of CO_2, &c., and in the measurement of flue gas temperatures, there is very often not enough care and consideration given to the selection of the points in the gas circuit at which the determination shall be made. Too often it is the case that expensive instruments for making these determinations are purchased, possibly after very deliberate consideration of the qualifications of the various types, and when they are installed in the boiler-room no precautions are taken or investigations made to ensure that the indications or records given by the instrument are representative of the total volume of gas handled. When installing CO_2 recorders or indicators, the point on the boiler unit, or other part of the plant, at which the gas sample will be drawn should be determined by the purpose for which the gas analysis is required. If automatic gas sampling and analysing apparatus is installed only for the purpose of assisting the stoker operators to maintain a maximum furnace efficiency, since the infiltration of air through the boiler setting will seriously affect the results recorded by the instrument, the gas sample should be drawn at a point where combustion should be complete, and where the effect of dilution due to excess air leakage through the boiler setting is negligible.

On the other hand, if the computation of heat losses is the only information desired from the instrument indications or records, the gas sample should be taken from a point which will include all leakage due to air infiltration through the setting of the unit. In the smaller plants it is customary to install only one instrument for the determination of the CO_2 constituent of the flue gases, and the sample of gas for analysis is usually drawn from a point on the main flue. Such a system is very inflexible for the control of combustion conditions, as it is difficult to ascertain exactly on what boiler unit inefficient conditions exist, or through which particular grate or other point excess air is being admitted.

(To be concluded.)

E

Electricity at the Paris Agricultural Machinery Show.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S., Chartered Civil Engineer.

For the third year running, France's largest agricultural machinery show has been held in the capital city, instead of following the previous custom of migrating from town to town in the provinces. This centralisation policy seems to be a great success, for the exhibition this year was bigger than ever, and the attendances were likewise much larger. The whole of the Grand Palais, on the Champs Elysées, was fully occupied, that is, a floor and gallery space comparable with London's Olympia. The show was held under the auspices of the French Minister of Agriculture, and also that of all farmers' associations, hence it was truly representative of the industry.

British manufacturers were well represented in those lines for which England is noted as being pre-eminent, *viz.*, thrashing machines, barn machinery, oil engines and tractors. Among these exhibits of British origin were thrashers by Ransomes, Sims & Jefferies; Clayton and Shuttleworth; and Ruston, Proctor; barn machinery by Bamford's; oil engines by Petter's and Lister's; and tractors by Austin's.

As was natural, under the present French policy of encouraging rural electrical distribution, considerable attention was paid to the electric driving of farming machinery. There were about 350 electric motors distributed among just over 400 exhibitors' stands—and as a relic of more barbaric days, there was one horse treadmill motor. Electric motors were freely used to demonstrate the operation of all kinds of machines. A considerable number of small electric lighting sets were on view. In the case of many direct-connected sets, the engine drove the generator by means of a flat belt interlaced between pins on the side of the fly-wheel rim, and pins mounted on a flange of large diameter attached to the dynamo spindle. This flange was recessed into the fly-wheel. Thus both sets of pins projected on the same side, rendering it easy for anyone to replace a broken belt. There are several methods of flexible drive by

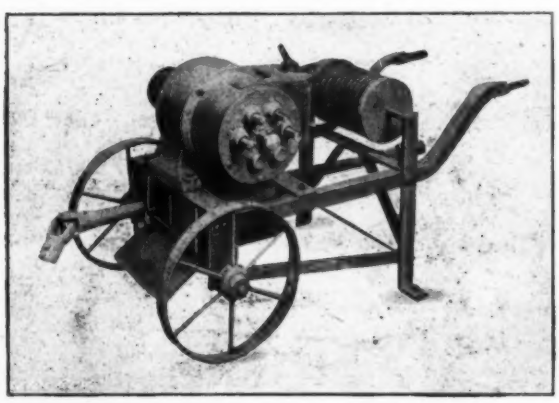


Fig. 1.—The "Law" Portable Farm Motor.

means of pins, leather belts, and rubber rings extant in England, but none are so easy of replacement, as the scheme now described. In those cases where the conventional belt drive is adopted, it is the usual practice to place a rectangular tank of square section for water cooling, between the engine and the dynamo. The switchboard is often mounted on the side of the tank. Thus a very compact, self-contained unit is obtained, in spite of the loss of space occasioned by the use of a belt drive. Further, the bugbear of having to wire to a switchboard, after the plant is delivered, is eliminated. These rectangular tanks give the sets a much neater appearance than in the case of the cylindrical tanks, which are customarily employed in England. The general design of these small sets as regards facility for keeping clean when in operation is no better than, and in many cases not so good as, in England. The finish in most cases (excepting certain reputable engine firms such as De Dion) certainly did not come up to British standards.

Several purely electrical firms exhibited motors, transformers, insulators, and overhead line material. Apparently the French agricultural motor has not yet reached the high standard of Scandinavian and German designs.

The question as to the best method of driving is evidently receiving considerable attention. Every effort is

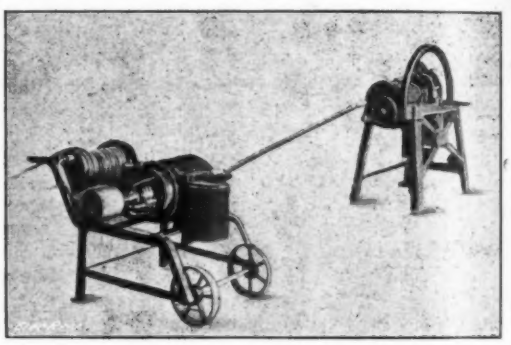


Fig. 2.—The "Law" Motor driving a Chaff-cutter with a Cardan Shaft.

being made to avoid countershafts, and by modifying the design of the machine to be driven, it is practicable to employ a single belt drive in most cases. In the best practice, the belt is, of course, eliminated, and the drive made direct. Several motor unit gears were shown, which provided for two or more changes of speed. One very compact arrangement was that of the "Law" transportable unit, which included a cable reel. This set, which is made by M. L. A. Wisler, is illustrated in figs. 1 and 2. A direct drive at 1,400 r.p.m. is obtainable on one side, whilst gear-driven spindles project at the other side, which run at 40, 60, 100, and 200 r.p.m. respectively. These spindles are generally connected to their work by means of a rigid tubular shaft, provided with Hooke universal joints. Occasionally a flexible shaft is used. The motor controller on this unit is directly attached to the side of the motor, which is a good feature, and is provided with a reversing switch.

Another new unit which offered several different driving speeds was the Fleno. The speed reduction in this case is obtained by means of a belt, with a jockey pulley to keep it tight, as the centres are short. A cable reel is provided, and also an extended platform to carry a special firewood log saw, or a pump (both of which are sold by the makers, as accessories). Figs. 3 and 4 show "Fleno" machines, made by Messrs. Pironneau, Fleischel & Cie.

The Société Générale Agricole showed a full-size electrically-driven cross-cut log saw, which, as it incorporated reduction gears, could also be arranged to drive a variety of farm machines. The saw is shown in fig. 5, and a truck motor, with three pulleys, A, B, C, and three shafts 1, 2, 3, giving nine different speeds, in fig. 7.

These transportable electric motor units, which offer drives at various speeds, undoubtedly meet the needs of

the farmer who is just beginning to use electric drives. However, it is the experience of the writer that while a farmer often starts by using one such unit of say 5 h.p., and a larger motor of, say, from 15 to 30 h.p., in a couple of years he will be employing 10 or 15 different electric motors, definitely installed to do particular classes of work; for the additional convenience, coupled with the saving in men's wages, more than compensates for the interest on the additional capital.

The oil engine is by no means as yet displaced in France, and a number were on view, but none was allowed to be shown in operation, on account of the exhibition being inside a building. Still, it was amusing to observe how quietly and well several of them were running—by electric power, as a demonstration. An Austin and another tractor were equipped with charcoal gas-making plant.

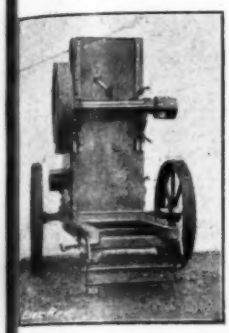


Fig. 3. The "Fleno" Truck Motor with Low-Speed Shaft.

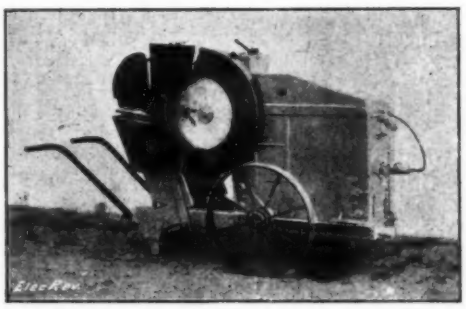


Fig. 4.—"Fleno" Motor Saw for Logs.

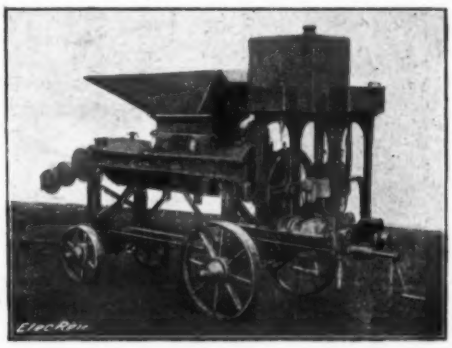


Fig. 6.—The Duchscher "Silent" Continuous Press.

Considerably more thrashing machines were provided with their own motive power (either oil engines or electric motors—the latter predominating) than would be seen at an English show.

There was a very large show of pumps. The great majority were of the electric directly-connected type, either centrifugal or rotary. The automatic high-pressure water supply system was represented, as it should be, by a large number of examples. For the ordinary lift pumps, variations of the chain hélice type were presented in extraordinary variety.

In addition to the recognised types of refrigerating machines, there were two novel forms. In one the compression device consisted of a large diaphragm operated by a connecting rod off a crank shaft. This arrangement permitted of the convenient placing of the electric motor directly underneath. The other design was intended for the production of ice on a very small scale. It consisted of an electric motor which, with the compression pump, was completely enclosed in a hermetically sealed case. The current was conveyed to the motor through sparking-plug type gas-tight connectors. In this way, there was no danger of the poisonous substance (bichloride of mercury) used as the compression agent escaping into the room where the plant was used. Incidentally, such a plant requires no attention, beyond an overhaul every few years.

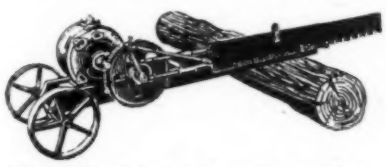


Fig. 5.—The "Sylva" Cross-cut Log Saw.

While there are now a number of satisfactory milking machines on the market, the perfect one has not yet been evolved. The difficulty in getting skilled milkers, whether men or women, is becoming so great in all countries that the mechanical milking movement has received a great impetus, and the prejudices which arose due to the defective plant of the earlier days is fast disappearing. At the Paris show, curiously enough a hand-operated milking machine was shown—one would hardly have thought this worth putting on the market. A new machine for the European market was the American "Precision." The chief novelty of this apparatus was that the electrically-driven vacuum pump was brought to each cow in turn, by means of an overhead runway. In this way, the necessity for installing permanent vacuum piping is eliminated, and the transmission losses due to a long pipe line are avoided. A Danish machine that was exhibited (the Dana) upset all previously conceived ideas as to the principles of mechanical milking, for the rate of the pulsations was controlled by the quantity of milk delivered. Further, cows could be milked dry, without the necessity for stripping—which is one of the drawbacks of every other milking machine on the market. The milking machine load is quite a useful one, as the main load comes on the distribution system before the factories start, and the lighter afternoon load is off before lighting hours.

A number of cream separators were shown with electric drives. In all cases these drives were on the second gear shaft, which permits of the machines being used by hand in an emergency; also motors suitable for running at 5,000 r.p.m. are not an every-day commercial article.

On the Continent, so many of the larger farms incorporate some form of rural industry with their work, that it was not surprising to see at the Paris show a number of alcohol, wine, and cider plants—mostly with electric drives. In accordance with modern practice, this machinery is gradually being adapted for the continuous system of manufacture. In this connection the continuous fruit press of Messrs. Duchscher & Co. was noteworthy (fig. 6). The fruit to be pressed is fed into the machine by a worm of gradually diminishing pitch. The reduction of the pitch causes the fruit to be gradually squeezed of its juices, until nothing but dry pulp emerges from the end of the machine.

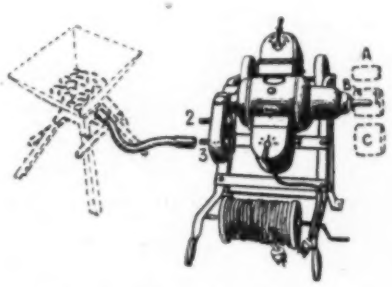


Fig. 7.—Truck Motor of the S.G.A.

Electric ploughs were demonstrated by a model on the stand of the Société Générale Agricole, which showed a set capable of ploughing 27 acres a day, as against the ¾ acre of a team of horses.

It is hoped that the above notes will serve at least to indicate what a good field agriculture is proving itself to be for the electrical industry—and it is a field of which the fringe as yet is barely touched.

Earthing the Neutral Point on 3-phase Transmission Systems.

By D. W.

THIS article is a plea for the adoption of the earthed neutral. While offering apologies for bringing up an age-worn bone of contention among eminent engineers, it yet appears that the pros and cons have not definitely enough been raked over to enable a proper decision to be made. Of course, a lot depends upon the layout and age of the particular system under consideration, but, with systems of any size at all, surely the earthed neutral comes into its own as a survival of the fittest. It is high time that the insulated neutral was condemned where e.h.p. transmission is concerned, particularly in the case of underground mains.

What advantages does an insulated neutral offer? It may be nice to be able to run on for a while with one phase earthed through a fault, but such operation will soon find out the weak spots in the insulation of the other two phases; if not at the time, the way will be paved for a fault to occur at some future date. The above advantage, it would seem, has been much overrated in the past; the attendant disadvantages are inclined entirely to outweigh any merit. Weakness lies in the fact that, in the event of one phase becoming earthed, the other two immediately rush to line pressure above and below earth, thus severely stressing the insulation. If these potential changes are made more gradual this danger is considerably reduced, insulation being better able to cope with gentle pressure variation than with surges of pressure plus "transients." Cable networks seem to have a firm rooted objection to such drastice treatment. In one large e.h.p. transmission and distribution system of London, nearly every time that a fault occurs, it is accompanied by one, two or perhaps even three other breakdowns! Apparently the initial fault earths one phase, and thus gives rise to the subsequent troubles which appear to come all together, so quick is the effect. One small advantage of the insulated neutral is a saving in the number of current transformers. At the same time, it does not seem sound engineering practice to have the potentials of any electrical system idly floating without any definite regard or relation to that of earth. A very great deal also depends upon the type and system of protective gear to be employed for the feeders, when choosing between the insulated and earthed neutral.

The next question is the best way in which to earth the neutral. It is not the best practice solidly to earth the neutral point, as an earth on any "phase" will then result in a direct out-of-balance short-circuit upon the generator whose neutral or star-point is earthed. It may be said, however, that even this drastic expedient is preferable to an insulated neutral.

A better arrangement is to earth the star point through a heavy grid type resistance, which will absorb, say, 10 per cent. of the generator capacity with full phase voltage. This admits of a more or less gradual potential change in the system relative to earth, as the current has to build up in the earthing resistance before the star-point is allowed to move from earth potential.

A method more nearly approaching the ideal is the use of the carbon powder resistance with its useful negative temperature coefficient, though at present this is a somewhat costly piece of apparatus. In this case, in the event of an earth occurring, the cold resistance at first passes very little current, but as it warms up, the resistance decreases gradually, allowing of a slowly accelerating but tardy rate of increase of earth current. Thus the potential surges encountered in the insulated neutral plan are eliminated. Then, with a proper and intelligent system of feeder protective gear, the faulty section is soon dropped. It may be well to mention the necessity for adequate "balanced" cable protection with the earthed neutral.

In connection with the earthing resistance circuit, the actual resistance in ohms, the desirability of including inductance, and the possibilities of an inverse time limit overload circuit breaker for limiting the current, are items awaiting standardisation upon the results of exhaustive research.

In earthing the neutral, it is better to earth the star point of the largest generator or transformer on load only. This may be accomplished by bringing each point to a pole operated isolating switch which connects it to a common bar to which the earthing resistance is connected. It is not advisable to connect the neutrals of two pieces of plant operating in parallel, as then the apparatus are in parallel on the outers and neutral as well, and there is the danger of excessive circulating currents.

Some Notes on Street Lighting.

By E. M. B.

RECENTLY the writer has been engaged on experimental street lighting, and the following paragraphs are the result of his experiences. The work included main and side street lighting, and many types of fittings were tested.

It is the diffusion rather than the intensity of daylight which makes it so wonderful, and it is this quality which the engineer endeavours to produce for general lighting. We can make a unit which will give us a strong enough light, but how to distribute it evenly is a problem which, in the writer's opinion, has not been satisfactorily solved.

The theory of illumination can be simply stated. We should use an infinitely large number of infinitely small units.

By this means we should reproduce the diffusion, without trying to reproduce the intensity of daylight.

It is the task of the engineer to reproduce a reasonable diffusion by using the smallest possible number of units; thereby incurring the smallest cost. He will also vary the intensity to suit the local needs.

The writer will give some figures which appear to fulfil the above requirements. For main street lighting he favours the use of large units placed at a big height, and with a large spacing between lamps, *e.g.*, to light a main thoroughfare, about 70 ft. wide, use 500-watt, gasfilled lamps, at a height of 25 ft., and spaced 60 yards apart.

For a smaller street he would use smaller units, nearer the ground, and closer together, *e.g.*, to light a street 50 ft. wide, use 60-watt, vacuum lamps, 15 ft. from the ground, and 40 yards apart. With this spacing tram standards could be used as supports.

A side street would require similar units to the latter.

and placed at the same height. There should be a unit on one side of the road only, and it should be placed on alternate sides with a spacing of 60 yards.

Some may be surprised that gasfilled lamps are not recommended for the smaller streets. This is because of the glare, due to the smallness of the light-giving area, the result being that if the filament is visible below the canopy of the reflector the eye is "caught," and if the filament is covered then only the area below the lamp will be lighted.

The reflector is the important link in the lighting equipment. To judge from the manufacturers' catalogues, there is a reflector designed for every circumstance, but the writer thinks that these are more directive than dispersive. He favours the use of a horizontal type, which has only a small camber; one about 2 ft. in diameter for a large unit, and half that for a small one. Those of the "tin hat" type are very good for spot lighting, but are of no use for general lighting. If they are already installed it is well to remember that the best result is obtained, with gasfilled lamps, when the filament is just above the level of the rim of the reflector.

If a totally-enclosed reflector is used with gasfilled lamps, there should be ample clearance for ventilation, otherwise the lamps' life will be short, and the leads "baked."

A boat-shaped plain mirror placed vertically at the side of the lamp is a very good reflector for small lamps, used in side streets.

In all fittings, manufacturers should make some arrangement allowing the lamp to be readily raised or lowered one inch, so that the filament can be adjusted to the best height, relative to the reflector, to suit local requirements. Again, the lampholder should be easily freed from the fitting, so that when the latter is screwed on to the bracket arm, the leads will not be twisted. Very few fittings are designed so that these adjustments can be effected. There is a vast difference between adjusting a fitting on the bench and doing the same single-handed on the top of a ladder when half a gale is blowing. The bigger such things as nuts and screws are, the better; B.A. sizes are rather inconvenient, and take some finding when they are dropped.

The writer does not claim that any scheme carried out in accordance with the foregoing suggestions would put Oxford Street in the shade, but he suggests that they would serve as a guide for lighting a small provincial town. Nor does he claim that the result will satisfy the public—far from it, thanks to the rivalry of multiple shops. These firms have a motto: "If you cannot make money, burn it!" So said a shop manager to the writer, adding that he was only quoting his directors' instructions. The resultant glare from the windows makes the street lighting look very feeble indeed, and the public wrath descends on the city fathers for their stinginess, and callousness. However, it is an ill wind that blows nobody any good, and the correspondence columns of the local Press are periodically flooded by the multitude; it is good for a mainsman to feel that his efforts do attract attention sometimes.

Charges of permitting immorality (young people will hold hands sometimes) due to the heathen darkness are hurled at the Street Committee, and Heaven alone could preserve that miscreant, the committee chairman, should an accident occur. The public know light, but they do not understand illumination.

The street lighting, however, will be sufficient normally, and the shop window lighting will give an added intensity during the busy hours.

The Use of Single-Core Cables on 3-phase Systems.

By E. BERRY NIXON.

In my previous article, published under the above heading in the ELECTRICAL REVIEW of November 9th, page 689, no mention was made of the necessity of transposing the phases. This should always be done with single cables, as, when they are in one plane, induction of the two outer phases causes a definite reactance of approximately 10 to 15 per cent. on the centre phase, thereby reducing the amount of current carried. Sometimes the reactance due to the outer phases will seriously reduce the current in the middle phase. This of course means that the outers are working at a higher density than they should be. By transposing at, say, each third of average runs, or running the cables in three-phase racks, the self-induction in each cable is neutralised.

An advantage can be obtained when using single-core cables by using a B.O.T. copper sheath, which would be insulated from the lead sheath by 1/16 to 3/32 in. of paper insulation. One set of ends would be insulated from earth. The remaining set at the other end of the line would be brought out separately, and each lead would have in series with it, first, a recording meter, and secondly, one coil of a three-pole relay.

The three are then starred as shown in the accompanying sketch, fig. 1, and passed through an alarm device, to earth.

The theory of the scheme is that the recording meters are in reality dielectric power-factor indicators, and they keep a record of the capacity current in each cable. It can hardly be said at this stage that this method is applicable to very long feeder runs; it is primarily intended for alternator cables, or on cable runs where the resistance of the sheath for one-half of the run does not exceed, say, 1.5 ohms. The sheath would be open-circuited at this mid-point, and one set of recording gear inserted at each end of the line.

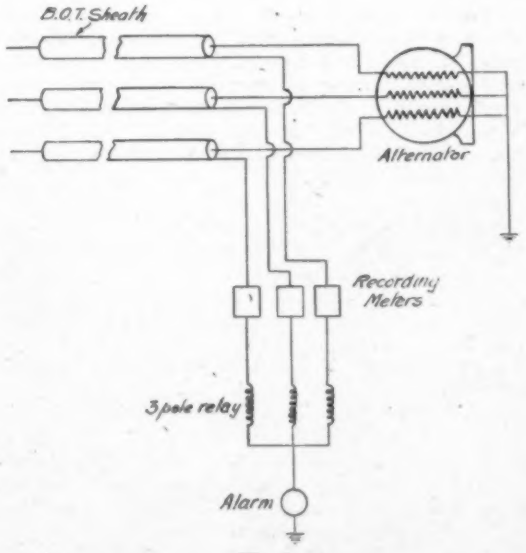


Fig 1.

Corona, ionisation, or weak places in the insulation, which cause partial faults, immediately they occur

result in an increase in the potential of the copper sheath on the faulty cable, which will cause a current to flow through the alarm device. It would be necessary to provide some form of protective device for the alarm, so that, should the fault current rise to a value which would injure the apparatus, it would be short-circuited. Immediately this alarm is received it would be possible to cut out the cable, in order to locate and repair the fault; the three-pole relay is merely a protective device which would operate the switch before the fault could reach the sheath. With this system the lead sheaths of the cables could be connected to the gear or sealing bells and so earthed. This would prevent the localisation of any leakage potential on the sheath, through one set of ends being open-circuited as is at present done. For the protective system it can be claimed that it is not influenced by overloads, and it could be set to operate at five amperes fault current.

The writer is of opinion that very valuable data could be obtained by the adoption of this scheme, and cable designers could have the advantage of inspecting cable faults before they broke down the cable. It happens too often that the initial stages of a breakdown are completely obliterated. Besides overcoming this obvious disadvantage to our records, it would possibly prove whether or no the action of having numerous condensers in series, through alternate layers of insulating material of different specific resistances, has any serious effect on cable operation. In the process of charging up these condensers we have enormous stress upon the inner portion of the insulation.

The writer trusts that someone with the necessary facilities will give a trial to this scheme.

Prices of Electrical Plant.

By D. N. DUNLOP.

In view of the interest being taken in the subject, the Editors have kindly invited me to make a statement about "Plant prices submitted by grouped firms in the B.E.A.M.A."

I am not in a position to make any official statement at present. The whole situation requires careful consideration by the manufacturers concerned, but from a long and close association with the electrical industry I may be able to throw some light on the question.

There is much in the present difficult industrial situation in this country to discourage British manufacturers, but I find among them "a resilience, a sort of hidden optimism, a resourcefulness of temperament and of energy" which is surprising. They do not lie awake at night thinking over the iniquities of their foreign competitors, who are in many cases represented in this country by competent British sales engineers.

"Rings" are not confined to this country; in fact, it is in many cases due to the policy of "rings" in foreign countries that low prices are quoted in this market.

Co-operation among manufacturers in their own countries is a necessity under modern industrial conditions. When British manufacturers sit in a "ring" at a round-table conference they are not considering how they can rob the purchaser and drive business abroad. Foreign "rings" function in protected home markets, British "rings" function under open competition from every manufacturing country in the world. British manufacturers, as a rule, dislike international "rings." They prefer to confine co-operation to the British Empire. For this they receive no credit. Some purchasers give first consideration to low prices irrespective of the country of origin. Other purchasers, and they are fortunately in the majority, prefer British manufacture and British quality and will pay higher prices for the home product. No one has had a greater opportunity than I of appreciating the friendly attitude of the majority of consulting, municipal, and company engineers to the British electrical manufacturer. A bright future awaits the industry if, as I hope, such close co-operation continues.

A glance at the balance-sheets of British electrical manufacturing companies will show clearly that there is no profiteering in the industry. A review of the balance-sheets of some foreign electrical manufacturing companies will show, in one or two instances, considerable losses and in other cases no dividends paid for a number of years. "Dumping" does not pay apparently. During the present period of serious unemployment British manufacturers in certain lines of production (not electrical) have tendered very low prices to Continental inquirers in the hope of obtaining some business to keep their workpeople employed. In spite of the much higher home prices (30 per cent. to 40 per cent. in some cases), the order was kept at home. Patriotism prevailed; the low price failed to bring the orders to England.

Now, with regard to "ring" prices, purchasers, who sigh for the return of the old days of cut-throat competition among British electrical manufacturers, complain of the uniformity of prices in British tenders. Why should prices vary considerably where designs of machines and manufacturing conditions are much the same? Standardisation of costing systems leads to uniformity of prices where conditions, on the whole, are similar. Cut-throat competition brings about the decay of an industry, and this condition of affairs is undesirable even from the purchaser's point of view.

The manufacturer of the finished product has no control over prices of raw material. He has to purchase castings, &c., at current prices. As to labour—the wages are controlled by agreement between employers and employed. Prices to-day make little, if any, provision for obsolescence, research, or dividends.

I see it stated in the Press in connection with one contract placed abroad that the quotation was in sterling, therefore not influenced by rates of exchange. I confess I cannot understand this. In many cases materials purchased from countries with depreciated currencies enable foreign firms to quote lower prices here.

As to Government inquiry: this seems to be used as a veiled threat, but where prices are reasonable no inquiry conducted on proper lines need be feared. Manufacturers naturally resent mere "fishing inquiries" conducted under conditions where information may be misused and sometimes get into the hands of competitors. During the war, inquiries were made by the Ministry of Munitions into prices of electrical apparatus, and the authorities were completely satisfied by the results. Present prices of plant are low in a country with a high standard of living and heavy taxation, and in many cases purchasers directly interested have had the facts disclosed to them and have been satisfied.

The extent to which the country loses economically by placing orders abroad is difficult to make clear in a brief statement. Too often the saving in price goes in unemployment benefits directly or indirectly. Technical and highly-skilled engineers are affected, and men stand at the shop gates day after day; the skill in the industry is impaired. Placing orders abroad carried to its logical conclusion would result in highly-skilled industries being closed down. The beginning of the last war revealed only too clearly how dependent we had become on foreign sources of supply of even vital necessities,

because it did not pay any British manufacturer to carry them on or engage in the research necessary for their continuous development.

Organisation in the electrical industry is more essential to-day than ever before. It is an industry of unique concern to the State in peace and war. Unemployment is a continuous threat to stability. Labour "rings" insist, and rightly insist, on a higher standard of living, but the price for steady and continuous progress must be paid.

No; we are not downhearted.

The Bradford Contract for Converters.

OUR Bradford correspondent writes as follows:—

Bradford Electricity Committee has just placed its order for four rotary converters with the Ateliers de Constructions Electriques de Charleroi despite the need for work of this description to be placed in England in order to relieve unemployment.

The difference in quotations between the Belgian and the lowest British tender is stated to be £4,000, and the Bradford Electricity Committee felt that it was far too big to be disregarded, so the chairman (Ald. Wilfred Turner), the deputy chairman (Mr. J. W. Longley), and the city electrical engineer (Mr. Thos. Roles) have been authorised to give the order. It is stated that only two members of the Electricity Committee opposed the decision, but that their opposition was very lively and that there is sure to be a heated discussion on the subject at the next City Council meeting. The plant concerned comprises four rotary converters, to be supplied from Belgium at a cost of £10,460 for the four, as compared with the lowest British tender of £14,500.

The capital expenditure of the Bradford electricity department has enormously increased in recent years owing to the high prices which have had to be paid for plant purchased from British undertakings in the effort to relieve unemployment. During the past financial year, it is stated, £44,000, which could otherwise have gone towards reduction of electricity prices, had to be devoted to reducing the amount of outstanding loans, whilst in addition over £10,000 was charged direct to revenue.

The public of Bradford have long been clamouring for cheaper electricity, and another factor which has influenced the committee is that the Belgian machines are so constructed that they can be housed at the new Sunbridge Road substation, for which they were intended, without any reconstruction of the building, which will effect a further saving of £3,000 by comparison with what would be necessary in acceptance of the British machines. There have been negotiations extending over four months in the hope that a British firm could be got to undertake the tender, but no firm has been prepared to come down to within £1,000 above the Belgian offer. The Bradford Corporation has all along kept strictly in mind the desirability of giving orders to British firms to relieve unemployment. In practically all cases the orders so given have been at a higher price than foreign tenders, and a notable instance was that of the recent order for a new turbo-generator for Valley Road works, a contract for £60,000. The committee feels that there is a limit to which it can go even in the good cause of relieving unemployment in England, and the majority of the committee feel this matter so seriously that they are prepared to forgo a Government unemployment grant for the new order for four machines rather than put the ratepayers to the expense of a difference so great in quoted prices.

The two members of the Electricity Committee and of its advisory committee who fought hard against the placing of the order abroad are said to be Mr. Walker Sutcliffe, who is himself in the engineering business, and Mr. G. R. Carter, secretary of the Bradford branch of the Amalgamated Engineers' Union. Mr. Carter endeavoured to raise the matter at last week's City Council meeting, when the order, although decided, had not yet actually been placed, but he was ruled out of order on the ground that the Council, in passing the minutes of the committee, had already given authority for the order to be placed. He is determined to raise the subject again at the March meeting of the City Council, even though it is too late to alter the decision.

So far as one can gather, there is a feeling in the Bradford Electricity Committee—which is possibly shared elsewhere also—that some British firms are taking advantage of the unemployment plea in trying to exploit municipalities by demanding exorbitant prices for orders which may be placed by sympathetic committees who desire to help relieve British unemployment. Mr. Carter, commenting on this feeling, contends that there should be a Government inquiry into conditions in the engineering industry to ascertain whether there is any justification for such a suspicion, but in the meantime he objects to British workmen being penalised for it by municipalities placing orders abroad.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

The Prospects in New Zealand.

I have read with interest the long letter in your issue of February 8th over the signature "Inductor" dealing with conditions in New Zealand, and I cannot allow his many misleading and apparently prejudiced statements to pass unchallenged.

To justify my claim to speak with some authority on the subjects under discussion, I would explain as briefly as possible that I am a New Zealander by birth and have been engaged in electrical work there since 1897. For the past 16 years I have been employed by my present Company, which represents the British Thomson-Houston Company (Rugby) and the General Electric Company (U.S.A.) for New Zealand, and is one of the two largest electrical concerns in that country. I arrived in London two months ago in connection with the business of our local office, which buys and ships to New Zealand general electrical merchandise outside our main agency lines.

The situation in New Zealand with regard to electrical workers is really exactly the same as I imagine it is in all other countries where electrical development is going on—there is work and good wages for the first-class man, but the indifferent workman will certainly find it hard, for, as your correspondent admits, we have "good experienced electricians there," both New Zealand trained and from this country.

The average New Zealand electrical worker is a capable and self-reliant man, and has proved by experience that he can more than hold his own at his own work with anyone in the world. If "Inductor" expected a virgin field for indifferently skilled men he was of course bitterly disappointed.

The class of electrical worker most needed in New Zealand is the first-class wireman accustomed to screwed conduit work, and familiar with 3-phase a.c. motor installations. Any man with the above simple qualifications will get work and plenty of it, and at good wages if he is a really good man. New Zealand does not require workshop or factory hands—we only install what we import—we do not manufacture. A certain number of armature winders with repair experience can be absorbed into the country, and a certain number of heavy erectors, but not many.

"Inductor's" statement regarding unemployment in Wellington last winter is misleading. Owing to bad local weather conditions not allowing various outside works to be carried on, a certain amount of unemployment of unskilled men resulted, but any privation was averted by the free distribution of relief food by the Wellington City Council. This only lasted for a few weeks and was mainly confined to Wellington. Surely the free food is to our credit and not, as "Inductor" appears to think, a deterrent to immigrants. I heard of no electrical workers being unemployed during that time; the Council would certainly have asked my Company for vacancies had electrical labour been offering, and any application for employment would have been brought to my notice.

With regard to our hydro-electric schemes, it seems strange that the managing director of an English firm, however world renowned, should be better able to judge our requirements after one short visit, than our own Government engineers who have been working out these schemes for years past. Up to date those hydro-electric schemes in operation, viz., Waipori, Lake Coleridge, and Hora-Hora, have never been able even to catch up with the demand, and new units installed start up with load, and in many cases overload, waiting for them.

The "partially developed" systems (I think "Inductor" must mean Mangahao) are providing work for a large number of men, as the various Power Boards which distribute the current are busy wiring up houses and motors ready for the supply as soon as it is available. This is in addition to the men employed by the Government in the erection of the generating plant and sub-stations.

Before leaving New Zealand I noticed advertisements appearing for several days asking for wiremen for the Wairarapa and Manawatu-Orous Power Boards.

Regarding Universities, your correspondent is in error: there is only one University in N.Z.—The New Zealand University; it has colleges in Auckland, Wellington, Christchurch, and Dunedin, just as Cambridge has various colleges, only owing to our scattered population we scatter our colleges also. It is the naming of these colleges that has misled "Inductor." By keeping terms at only one college—Canterbury—can a B.E. degree be obtained, and so far there has been no difficulty in placing all graduates, many of whom come to England or the United States for factory and "test" experience.

"Good" jobs are certainly hard to get in New Zealand. Can "Inductor" say in what country they are easy? With a total population of 1¼ millions it is obvious that there cannot be as many jobs of any sort as here—surely it follows that the "good" jobs are proportionately fewer and harder to get.

Our High Commissioner's Office most emphatically does not mislead intending immigrants, but on the contrary goes to an infinite amount of trouble in an endeavour to find out

whether an applicant for an assisted passage is suitable or not. The difficulty in nine cases out of ten lies in the applicant's not being perfectly frank regarding his capabilities. If he describes himself as a "competent wireman" and produces references to that effect, and then on arrival in New Zealand it is discovered that he is only used to casing or slip conduit work and consequently has difficulty in obtaining employment, surely the High Commissioner is not to blame!

If an immigrant is "disgusted" because he has to dig a post hole, he had certainly better stay here, where you put most of your wires underground and so many posts are not required, but I say emphatically that if he stays digging post holes in New Zealand for "many years" it is undoubtedly because he is fit for nothing better. I will personally guarantee an engineering job to any competent electrical worker who has emigrated to New Zealand and has been able to obtain no other work for "many years" except digging post holes. In passing, I would remark that the mechanical post-hole digger is coming more and more into use, so that that job may automatically disappear shortly.

During the war I was at one time detached from the N.Z. division on loan to the R.E. During that time I made many friends amongst both officers and men. Some of these I have since nominated for immigration, and without exception they are all delighted—not "disgusted"—with the move.

Referring to the latter part of your correspondent's letter, dealing with matters of general interest, I will endeavour to deal with each paragraph as briefly as possible:—

(1) Cost of living is lower than in England. Clothes and house rent are higher, but food is infinitely cheaper, the total advantage being at least 10 per cent. in favour of N.Z. The comparison with America is ridiculous.

(2) A minimum wage is fixed by law, and it is this that is often the stumbling-block for the indifferent worker who cannot keep up with the next man and has difficulty in earning even the minimum. This minimum is exceeded in my own Company by at least 25 per cent. of our employés, and we are by no means unique in this respect.

(3) Membership of a union is *not* compulsory, but, as here, men are urged to join by other unionists. Our method of dealing with our strikes is our own and I think appeals to all thinking men.

(4) Licensing of wiremen is in force, and an interview with an applicant is held in every case. If satisfactory credentials proving proper apprenticeship or service are produced, nothing further is required, and a licence is granted. Failing this, an examination (written, oral, and practical) is required. Examinations are held bi-monthly, not yearly. I was one of the original members of the first examining boards formed in Christchurch, and have been in close touch with this work ever since.

(5) "Inductor's" comments on un-British treatment, etc., are really too absurd to need reply, but there may perhaps be just this much in his remarks, that we occasionally have new arrivals who will persist in reiterating "it is done in England this way." This is not wise—he is in England no longer, and must bow to our ideas, crude though they may appear, or else return "disgusted."

In conclusion, I shall be only too happy to advise or give information to any electrical man, either technical or workman, who contemplates going to New Zealand, and it *is* the finest country in the world, in spite of "Inductor's" discouraging letter.

Nelson Jones,
Assist. Gen. Manager,
The National Electrical & Engineering Co., Ltd.
(Head Office, Wellington, N.Z.).

London.
February 15th, 1924.

The Position of the Colliery Engineer.

In acknowledging yours of the 8th inst. we must thank you for the very considerable space you have given to this subject—important though it undoubtedly is. You are still disposed to be highly critical of the work done and the attitude maintained by the A.M.E.E.

It is good of you to give the A.M.E.E. credit for a membership of colliery electrical engineers who are competent in that they have "ambition and ability." Everyone will agree with you "that the duties of a colliery electrician can only be efficiently performed by adequately trained men, and that it ought to be impossible to entrust them to others." Thus you give all colliery electricians a clear recommendation to qualify for and join the ranks of the A.M.E.E. The Association holds examinations and issues certificates of competency; it is stringent in its scrutiny of applications for membership: it has definite aims and objects which all make for safety in mines and the development of mining electrical work by advancing the competency and knowledge of those who have any authority or control over the uses of electricity in and about mines.

Apparently you concede that the Association is successful in its aims. In fact, you and we seem to have but one difference.

Your opinion is: "We hold that the Government would act if pressed by the Association; that the time is more than ripe for action; and that it is the duty of the Association to press the Government, in order that none but competent men may be placed in charge of the lives of men underground." That is your opinion in just so many words and it clears the argument from your point of view.

Our point of view is that it is no part of the Association's business to press the Government or any other body in the matter of the adoption of certificates.

On behalf of the Association of Mining Electrical Engineers,
W. T. Anderson,
President.

Manchester, *February 23rd*, 1924.

[Reference to our leader of December 14th will show that we took the same ground at the commencement of this discussion. We regret that the official attitude of the Association is adverse to its taking action in the direction that we have indicated, and we have shown that some, at any rate, of its members are in agreement with us on this point. We believe, too, that the majority of competent colliery engineers and electricians, whether members of the Association or not, would heartily welcome the adoption of compulsory certification.—EDS., ELEC. REV.]

A Non-technical Explanation of Power Factor.

I have read Mr. C. Turnbull's interesting non-technical explanation of power factor, and if the motor is considered to spit idle current out into the mains and such current is intercepted by, say, a static condenser, such static condenser would in fact become an electrical spittoon; now as this electrical spittoon will promptly spit the current back again at the motor, but not at the alternator, it is a spittoon of a particularly unpleasant type.

I hope I have a certain sense of humour, and it appeals to me immensely to feel that I can now approach a consumer on these lines:—

"Sirs,—Your motors are all suffering from consumption, and are spitting at the alternators in the power station a most venomous current which is causing overheating of the mains, transformers, and generators.

"I have to offer you an electrical spittoon, price £300, which, when installed on your mains, will collect this most obnoxious fluid, and is fitted with an instantaneous re-action device whereby it promptly spits back such current to the motor, as is most justly its due.

"By relieving the supply mains, transformers, &c., of a disease which otherwise would give rise to abnormal temperatures and other irregularities in the distribution system, we estimate that you would be rewarded by a reduction of your power supply bill of £200."

Yes, this explanation certainly has possibilities, particularly if the consumer has a sense of humour, but as an engineer I should feel it a little degrading to have to consider myself a vendor of *electrical spittoons*.

E. W. Dorey.

London, *February 19th*, 1924.

Two-way Pendant Switch Flexibles.

"Safety First's" letter in your issue of the 15th inst. interested me in the question of a ratchet 2-way ceiling switch as, some time ago, a fire occurred on one of my installations (nothing serious, luckily—only a burnt sheet and pillow-case) through the "shorting" of the "flex" to a pear-switch for a bed-head light.

But I would not chance a recurrence at any cost, and had decided to refuse to wire pendant switches when I ran across just such a ratchet 2-way switch as "Safety First" describes. I now fix these above the picture rail over the bed, and use a length of bell-flex and an acorn (as used for blind cords) for the pull.

The switches are not easy to obtain (I don't know where I shall buy the next lot when these run out), but, as long as I have any left or can buy more, if a customer insists on the pear type of switch, I will gently but firmly have nothing to do with it.

P. M. B.

February 19th, 1924.

Regarding W. H. S.'s remarks in last week's issue, I beg to give my opinion on this subject with reference to the faults stated by him. As there is always an "intermediate," a strapping wire, alive even with both switches on the "off" position, practically speaking, two of the three flexibles entering the pendant switch are "alive." Should at any time, for instance, the above-mentioned leads become bared or charred (this usually happens at the switch or ceiling plate end), the circuit will be, of course, complete; therefore, the lamp or lamps will light in the ordinary way through the faulty flexible, not the switch. I should think the above-mentioned explanation should clear or help to rectify No. 1 problem. No. 2, regarding red hot flexible, there being an intermittent connection as stated above, this loose or frictional contact causes heat, due to arcing across the weak point of the down lead. Unless noticed and repaired as soon as possible, the cord will soon be ablaze, and surrounding

property ignited also. Seemingly, W. H. S. viewed his fault in its infancy. Hoping this will enlighten W. H. S. and all interested in this discussion.

Samuel J. M. Ewart.

Aberdeen, *February 18th*, 1924.

A Libel on the Megger.

After reading Mr. Evershed's letter in the January 18th (1924) issue of the ELECTRICAL REVIEW, and being of a rather inquisitive turn of mind, I consulted Mr. Bennett's paper and found the actual wording of that part to which Mr. Evershed takes exception to be: " . . . The Megger is very sensitive to atmospheric conditions and should never be used (for testing porcelain insulators on high-voltage lines is understood in this text) early in the morning, late in the evening, or when the humidity in the air is greater than 85 per cent., as the leakage under these conditions will result in the condemning of many insulators that would show in good condition if tested on a dry sunshiny day, or if subjected to an actual test voltage."

From the wording of Mr. Bennett's paper the undersigned takes it that the reason for the misleading Megger readings is, in effect, short-circuiting of the Megger by the film of moisture on the surface of the insulator, but he does not understand that anything out of the ordinary need occur either to the insulator or the Megger. Nevertheless a condition exists which results in Megger readings that do not indicate the value of the resistance of the insulator itself, so that it becomes necessary to confine the Meggering of insulators to periods when this transient effect can be eliminated, if the Megger indications are to be of any use to the operating man.

Certainly, the men who in the past eight or ten years have been testing earthenware insulators on high-voltage lines do not belong to the same school as Mr. Evershed's "topsy-turvy" engineers. From the published results of operating practice it seems that the men in charge of the operation of high-voltage overhead transmission systems investigate inconsistencies and make public the results of their investigations and experience; sometimes such results show that some particular type of apparatus has certain limitations, but this does not necessarily detract from the usefulness of that apparatus under proper conditions.

In the company with which the writer is connected we use quite a number of Meggers, use them regularly, and place a great deal of reliance on the Megger indications both when they are what were expected and when they are not what were expected, provided that they are consistent, or that inconsistencies can be accounted for or eliminated. This is quite common practice in America and, the writer suspects, in New Zealand.

The present generation appears to have the habit of seeking information in contemporaneous publications, only consulting those of ten or a dozen years ago when the more recent papers do not give the required data, and also to seek information from people having extensive practical experience regarding the special subject (such as testing insulators on high-voltage lines) in which the individual is interested. During the past year many prominent American engineers have visited Europe on behalf of large operating companies to study British and Continental practice with high-voltage underground cables, as it is realised that European engineers have had a wider experience along these lines than the Americans; probably for similar reasons English engineers are seeking information as regards high-voltage overhead-line practice from America, New Zealand, and Barcelona.

F. M. Gillespie.

Barcelona, *February 16th*, 1924.

Squirrel-cage Motors of over 5 h.p.

On reading the REVIEW of last week I came across a letter which, I must confess, for a moment or two, gave me a shock. Was I dreaming of the far-gone days of my youth when one was accustomed to the rule: "No squirrel-cage motors exceeding 5 h.p. allowed to enter here"? But, no, this is really 1924, when such dear old grandmotherly legislation is supposed to have gone for ever. This, too, is our special year, for are we not to have our great exhibition in which to show the world that this old country is still very much alive and progressive? There will be exhibits of every description, showing the marvellous developments and improvements of recent years, and yet, is it possible that the "powers that be" be guilty of such an absurd restriction as Mr. Mason would have us believe?

As Mr. Mason has already remarked, it will not be very difficult to imagine what our American and Continental friends will think of our electrical "push" when they see costly slip-ring motors driving tools which could equally well have been coupled to the less expensive and more robust type of squirrel-cage machine; and I consider that the exhibition authorities are doing a great injustice to our British electrical manufacturers by imposing such a ridiculous restriction. Surely, if ever there was a time when our own people needed every encouragement, so as to meet oversea competition, it is to-day; and when we see squirrel-cage motors increasing by leaps and bounds, both in quantity and capacity, in every phase of electrical life, it is difficult to believe that at this great exhibition they are to be practically banned.

I have been familiar for years with squirrel-cage motors, ranging up to 250 h.p., with power-station plant not exceeding that of the Wembley station, and can testify to the excellence of such machines, the starting of which had no appreciable effect on the station or cables, the machines being coupled up to all manner of drives, including motor-generators, pumps, shearing machines, and general engineering tools; whilst in the steel rolling-mill business they are also operating perfectly satisfactorily on live rolls, starting and reversing at a rate of 750 times per hour.

In conclusion, I would like to mention a very interesting plant installed as long ago as 1907. The power station consisted of three turbo-generators, each of 750 kW, and over and above the smaller auxiliaries were six squirrel-cage motors coupled to pumps, two of the motors each being rated at 750 h.p., two at 450 h.p., and two at 350 h.p.—two only of the pumps being required at one and the same time. This plant was of Continental manufacture, and proved to be an out-and-out success.

Progressive.

Middlesbrough, *February 18th*, 1924.

The criticism of my letter, dated January 31st, by "Motor Sales Engineer" is greatly appreciated, but my remarks referred only to *standard* s.c. motors with *standard* drives. Switching a motor direct on to the line may cause damage to the connected machine due to the high torque which may be developed under these conditions. Large belt and pulley capacity or, in the case of a gear drive, large pinions would, of course, do much to remedy this, but most users will not go to the expense of fitting any gear which is not standard.

I should expect a greater "kick" when changing over from star to delta running and more heating of the motor with a star-delta starter than if started by the direct-starting method.

A *special* s.c. motor with a falling speed characteristic is undoubtedly the best drive for a shearing machine, and should do away with the "kick," which appears to be so objectionable to most supply authorities.

E. W. Walker.

Manchester, *February 19th*, 1924.

If a stranger may butt into your correspondence, I should like to say that all this talk about power companies objecting to squirrel-cage motors strikes me as being pretty thin.

What is a power company for? To supply power—will it refuse a load? Not unless it is mighty different from any power company on the other side. No, sir! it looks much more like some trick of your motor manufacturers to get more money. Now, when I asked here for some motor prices, some of your makers quoted me for the ordinary sort of motor without any frills, but others sent in a price for a motor with a sort of small rabbit hutch at the end containing rings and brushes—and some price, too.

When I wrote these people that I didn't like brushes rubbing on rings all day long, and I didn't like their prices either—did they leave them off and reduce their price? Not on your life!—they quoted an extra price for some contraption for putting them out of action, and raising the brushes. Can you beat it? Do you use any motors in your country, anyway?

Canacus.

February 23rd, 1924.

Delayed Deliveries.

Having followed the recent correspondence in connection with the above subject, may I be permitted to add a "grouse" in this direction?

Being in the market for a small power motor, I referred to the catalogue of one of our chief manufacturing concerns, and there found the very machine to suit my purpose. On making inquiries at the local office, I was informed that delivery could be effected ex works stock. After the order had been placed, I was notified that unfortunately the motor in stock had been sold a few days before my order was received. Following further correspondence, I was offered delivery in three weeks, and on this understanding instructed the firm to proceed with the order. This was on December 17th, 1923, and after a period of over eight weeks I am still awaiting delivery.

I may say I was offered a foreign machine ex London stock, and now regret I did not accept that offer. It would be far more satisfactory to all parties concerned, and at the same time create a better feeling of confidence, if manufacturers would only state a delivery they intend to comply with.

C. A. B.

February 18th, 1924.

Plumbing Joints.

In reply to Mr. B. Welbourn, regarding the practice of anointing the completed joint with tallow, there are two reasons—a major and a minor one. The chief reason is to cool the joint. Good plumbers' solder is made of a mixture of two parts of lead to one part tin; when the joint is being

wiped there is a tendency for the tin to run to the bottom of the joint, and it takes all the manipulative skill of the jointer to keep the mixture correct. The tallow is run over the joint to retain the tin in its correct proportion, and thus save the joint from becoming porous.

The minor reason is that the tallow cleans the joint and washes out any dirt which might otherwise be retained in the pores of the metal.

Frank Gould.

Birmingham, *February 18th*, 1924.

Salesmanship.

The writer of the letter on the above subject in your issue of this week seems to have been very unfortunate. Now a great deal of what has been said on the subject is both true and new, but what is true is not new, and what is new is not true. Amid the welter of phrases, the jargon of schools, the multiplicity of methods, and faint echoes of incipient personalities is one fact: The salesman is born and not made—he can be improved and developed on the basis of faculty of sympathy and understanding, but, as Saint Athanasius said with reference to another matter, he is "neither created nor begotten, but proceeding." In reading "M.I.Mech.E.'s" letter, it is quite obvious that the salesman in question disregarded St. Paul's injunction—who, by the way, seems to have had a profound worldly as well as Divine wisdom—"Be all things to all men." In the tabulated columns of his mind against indexed types of buyers, this salesman had got the valuable information he had learned in the schools, at different levels, and he was anything to any man—or, in more homely words, the squire's medicine for gout was no use for the parson's sore throat.

I said in a previous note to your paper that a salesman is a highly-tempered, but withal a very sensitive instrument of commerce. Now, to send a man out to get business such as is described in this week's Review, is hopeless—the management who employed him on such work was to blame. He was obviously a square peg in a round hole. There is no formula for understanding, there is no stock solution of problems whose only similarity is their elusiveness. The distance between the mental outlook of the man who lets the buyer gasp impotently and wait to get in on a comma and that of him who leaves the impression behind him of a transient and embarrassed phantom is incomprehensible to all but the real salesman.

D. P.

London, *February 18th*, 1924.

Letters have been received too late for this issue from Messrs. A. J. Lawson, R. Borlase Matthews, "Peeping Tom," "Cui Bono?" "Not an Old-Timer," and "A.J.S."

Business Notes.

Bankruptcy Proceedings.—Robert Stockman Mace, 4, Swanhurst Lane, King's Heath, Birmingham, late trading as Mace Bros., 8, Washington Street, Birmingham, general brassfounder and wireless goods manufacturer.—The first meeting of the creditors of the above was held on February 13th at the Official Receiver's office, Ruskin Chambers, 191, Corporation Street, Birmingham. According to the statement of affairs there was a deficiency of £1,306. Debtor attributed his failure to losses made by speculation on the Stock Exchange, bad trade, ill-health, and losses incurred in the manufacture of wireless goods. It appeared that after 1915 debtor assisted his brother, who traded as a brassfounder in Washington Street. In June, 1918, debtor acquired the business for £900. He stated that in 1922 he was induced to take up certain shares for which he was not in a position to provide the purchase money. He had paid amounts on account from time to time, and there was now a balance outstanding of £519. It was alleged that debtor had, on account of this, been short of ready capital, and he had borrowed money from moneylenders and friends. In December, 1922, he commenced manufacturing wireless goods, and incurred large losses through selling under cost price. The meeting was adjourned to consider an offer to pay a composition of 6s. 8d. in the £.

J. E. Elliott & Co., 12, Broad Street, Oxford, electrical engineers.—A sitting of the London Bankrupcty Court was held on February 20th before Mr. Registrar Hope for the public examination of John Edward Elliott and James Mountjoy Elliott, who carried on business under the above style. The receiving order was made in August last on a creditor's petition presented to the Oxford County Court, and a statement of affairs has been lodged showing total liabilities £3,440, of which £2,730 is expected to rank for dividend, against assets valued at £159. In 1908 the debtor J. E. Elliott entered into partnership with his brother, J. M. Elliott, a Mr. Kingerlee and a Mr. Bradley at 12, Broad Street, Oxford, but the last-named two gentlemen were paid out of the firm in 1911. J. M. Elliott contributed £550, and the remaining capital was provided by Kingerlee and Bradley. To enable them to pay out their partners, the Elliott Brothers borrowed £1,000 on mortgage of the business at 10 per cent. interest, and to provide capital they raised in all about £3,000, the bulk of which still remains owing. In 1913, J. M. Elliott went to British Columbia and became a fruit farmer, and although he is regarded by J. E. Elliott as a partner, he apparently has taken no part in the business since 1913. J. E. Ellictt alleges as the cause of insolvency the war and losses on contracts, resulting in a net loss on the trading each year since 1914. In 1917 he became an inspector of war material for Vickers, Ltd., and remained with them until 1922, the business in the meantime being left to the care of the manager. Since 1922 he has endeavoured to manage the business from London, and has been principally engaged in endeavouring to raise money upon the business by negotiations for floating it as a private company. The debtor, J. M. Elliott, joined the firm as a third partner, and contributed £550 capital. Since September, 1915, he has been employed as inspector of material, and more recently as inspector-engineer, and he has taken no active part in the conduct of the firm. Replying to Mr. Walter Boyle, Senior Official Receiver, the debtor, J. E. Elliott, admitted that he had been insolvent since August, 1920, and the whole of the present liabilities had since been contracted. He had supplied the Official Receiver with a list of losses sustained on contracts, the heavier ones dating back to 1914 and 1915. Recent losses had relation to work accepted for some private residences, and such losses were due, not to any error in estimating, but rather to the fact that the builders were in arrear with their work. Asked regarding drawings, witness said he had taken only £660 out of the business since August, 1920, and his brother, J. M. Elliott, had drawn nothing since 1915. The examination was concluded.

George Albert Morley, electrician and wireless engineer, 201, Powis Street, Woolwich, Kent.—The public examination of this debtor was held recently at the Court House, Greenwich. The statement of affairs showed liabilities of £787, and there was a deficiency of £529. Debtor stated that for some time he had been employed in the Royal Dockyard, but as a result of the reduction in his wages, and also owing to the fact that he had opened electrical and wireless shops in Powis Street, Woolwich, and Vauxhall Bridge Road, he left his employment in July, 1922, with £81 gratuity, and concentrated on his business. In March, 1923, he entered into an agreement to purchase for £300 the patent rights of a crystal receiving set, undertaking to pay this amount in instalments covering a period of less than three months. As a result of the great slump in wireless which took place at that time, he made nothing out of the invention. He had paid £74 on account, and subsequently judgment was obtained against him for the balance. He opened another shop, but soon lost £30 or £40 on this venture. He had spent about £100 on wireless experimental work and taking out provisional patents. He had had recourse to moneylenders. He attributed his failure largely to depreciation, and said he had given his wife £100 which he had borrowed to pay off the mortgage on his wife's house. The examination was adjourned.

Sherard Cowper-Coles, Rossall House, Thames Street, Sunbury-on-Thames, Middlesex, galvanising plant manufacturers.—The first meeting of the creditors was held on February 15th at 29, Russell Square, W.C.1. The statement of affairs showed liabilities of £1,236, against assets of £116, or a deficiency of £1,120. For the last 27 years debtor had been carrying out experiments in metallurgical work, and had patented a number of inventions and processes. His income, derived from royalties, sale of rights and consulting fees, had been spent mainly in experimental work. Since December, 1922, he had had recourse to moneylenders. Under an agreement dated March 30th, 1922, he sold his patents, inventions, &c., to a limited company in consideration of the allotment to him of 5,000 £1 fully paid shares therein, and the payment of £2,000 in cash. At the date of the receiving order all the shares had either been sold or charged by him for £1,450 in all, the main portion of which sum had been used in experimental and business expenses. The case being a summary one was left with the Official Receiver as trustee.

W. A. Beaumont, electrical engineer, 44, Warrengate, Wakefield, Yorks.—Receiving order made February 15th on debtor's own petition. First meeting February 29th at the Official Receiver's office, 21, King Street, Wakefield. Public examination, March 13th, at the Court House, Wood Street, Wakefield.

G. H. Chard & Co., electrical engineers, 24a, Great Portland Street, W.1.—A bankruptcy petition has been presented by Messrs. Berry's Electric, Ltd. The date of hearing was February 26th.

Hudson's Electrical Engineering Co., electrical engineers, Prudential Buildings, Park Row, Leeds.—Receiving order made February 15th on creditor's petition.

F. W. Chamier, 59, Fleet Street, E.C., mining and electrical engineer.—Released January 30th. Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C.1.

GEORGE WM. ARTHUR CHARLES ALEXANDRA, 10, Iddlesleigh House, Caxton Street, Westminster, S.W.—This debtor again attended on February 20th at the London Bankrupcty Court in relation to his public examination upon accounts showing total liabilities of £7,160 (unsecured £6,810) and net assets valued at £1,444. The Official Receiver reported that he had no further questions to put to the debtor; the examination was adjourned from December 20th on the application of the trustee, who desired an opportunity to make certain investigations, and also to give the debtor a chance to submit a scheme for the consideration of the creditors. It was understood, however, that no scheme had been lodged, and the trustee not evincing any desire to question the debtor, the examination was concluded.

W. J. DICKEN (trading as W. Dicken & Son), electrical engineer, 2, Upper High Street, Bargoed, Glam.—Last day for receiving proofs for dividend March 8th. Trustee: Mr. E. Owen, Official Receiver, 34, Park Place, Cardiff.

Company Liquidations.—H. HAYDON & Co., LTD., electrical engineers, late wireless manufacturers, 18, Sanvey Gate, Leicester.—Pursuant to Section 188 of the Companies (Consolidation) Act, 1908, a meeting of the creditors of the above was held on February 11th at the offices of Messrs. A. C. Palmer & Co., C.A., Court Chambers, Friar Lane, Leicester, when the chair was taken by Mr. T. Fleming Birch, who stated that he had been appointed to act as the liquidator in the voluntary liquidation of the company. The statement of affairs presented disclosed liabilities of £3,091, of which £1,819 was due to unsecured creditors, and the balance of £1,272 to the bank. In addition, there was a debenture for £1,200. The net assets to meet the claims of the unsecured creditors were £88, or a deficiency of £3,003. The company was formed in May, 1922, to take over the business of a partnership carried on by H. Haydon, C. Seeby, and W. Haydon, trading as H. Haydon & Co. The trading loss for the period to March 31st, 1923, was £533, and there had been a further loss from that date to the date of liquidation of £1,905. The losses were attributed to the failure of the wireless business, which was discontinued, and owing to shortage of capital the company was unable to get supplies promptly. Mr. Birch had been appointed as receiver on behalf of the debenture holders, the bank. After some discussion, the meeting broke up without any resolutions being passed; the voluntary liquidation of the company will, therefore, be continued, with Mr. Birch as liquidator.

HOLBORN RADIO CO., LTD., 267, High Holborn, London, W.C.—A compulsory winding-up order was made against this company on January 18th upon the petition of the Sterling Telephone & Electrical Co., Ltd. The first meetings of the creditors and shareholders were held on February 21st at the Carey Street offices of the Board of Trade.

Mr. G. Digby Pepys, Official Receiver, reported that the company was incorporated on October 30th, 1922, as a private company, with a nominal capital of £1,000, divided into 450 ordinary and 550 preference shares, all of £1 each, and its objects were to acquire and carry on the business of the Holborn Radio Co., which was a partnership concern dealing in wireless installations. The first and only directors were the signatories to the articles of memorandum of association, and they were Charles William Hine, who resigned in February last, A. V. James and John Deverill. In December, 1922, they appointed themselves to salaried posts in the company, Hine becoming sales manager, Deverill stores manager and buyer, and James the secretary, and they each became entitled to a salary of £5 a week, in addition to their remuneration as directors. The company was formed by the directors, and James had stated that he began the business in partnership with Hine in August, 1922; the business consisted of the assembling of the manufactured parts of wireless apparatus into complete wireless sets, which were sold under the name of the "Deskaphone." It was decided to convert the business into a company in October, 1922, in consequence of the firm being joined in partnership by Deverill, who introduced fresh capital. James had found £165 and Deverill £150 for the purpose of the business, while Hine had found goods to the value of £50. The sale and purchase agreement was dated November 1st, 1922, and it provided for the acquisition by the company of the partnership business as a going concern, at the price of £447. Later, in his report, the Receiver stated that in March last the sales of wireless sets dropped in consequence of the general uncertainty prevalent with reference to the issue of licences. Accounts were prepared as at April 6th, 1923, and they showed that the first six months' trading had resulted in a gross profit of £1,497, but after charging overhead expenses a net loss of £110 had been sustained. The directors then appeared to have cut down their expenses. The company seemed to have been short of working capital, and on May 30th Deverill advanced the sum of £100, while on September 3rd a like sum was lent by James. On August 15th James and Deverill, as directors, issued to themselves debentures for £120 and £123 respectively, to secure repayment of their loans, and also some small amount spent in travelling, &c. In September a creditor who had obtained judgment against the company levied execution, and on September 24th Deverill, as a debenture holder, appointed James as receiver and manager on behalf of the debenture holders under powers contained in his debenture. James had stated that as receiver and manager he continued the business, with Deverill as his assistant, until January 12th, in the hope that trade would improve, and that the assets would realise a fair price. The effect of that arrangement was, so commented the chairman, simply this: James as receiver and Deverill as his assistant continued the business in precisely the same manner as before. On January 12th, James purported to sell the company's stock to Deverill for £567, out of which he re-paid a loan which he obtained for the company in his capacity as receiver. That loan was £150. He also paid £46 to himself on account of salary and £62 to Deverill as his employé; while £251 was utilised to satisfy the debentures and interest thereon. He made a further payment of £55 on account of salary due to himself and Deverill, or rather arrears of salary due from the company. The Official Receiver had ascertained that the price at which the sale was effected was reasonable, and that the amount realised was probably above that which would have been obtained by a forced sale, but certain of the payments should not, in his opinion, have been made, and he called on James and Deverill to refund the sum paid in arrears of salary. According to the company's statement of affairs, which disclosed the position as at the date of the receiver's appointment, the liabilities amounted to £1,474, of which £1,123 was unsecured, while the assets were estimated to realise £1,061. Most of the stock and the book debts had already been realised by the receiver, while the remainder of the stock had fetched £23 by auction. But after payment of the costs of the petition, there could be no surplus in the liquidation, and there was no prospect of the unsecured creditors receiving a dividend unless James and Deverill repaid the amounts which it was submitted had been improperly received by them. The liquidation was left in the hands of the Official Receiver.

ANGUS RAILWAY CONTROL, LTD.—Winding up voluntarily. Liquidator, Mr. E. Boothroyd, 79, Mark Lane, E.C.3. Meeting of creditors at this address on March 3rd.

MAGNETIC SIGNS & CARRIERS, LTD.—Meeting of creditors held on February 28th at 150, Finsbury Pavement House, E.C.2.

BROOK, HIRST & Co., LTD.—Meeting at Northgate Electrical Works, Chester, on March 24th, to hear an account of the winding-up from the liquidator, Mr. E. W. Humphreys. The business is merely formal, being for the purpose of the transfer of the company's business which has been continued without any interruption.

EAST LONDON MICA CO., LTD.—Particulars of claims to be sent to the liquidator, Mr. W. Wesson, 7, Hanover Square, W., by March 31st.

RUSSELL ELECTRICAL APPLIANCES CO., LTD.—General meeting at Bank Chambers, 76, Kingsland High Street, E.8, on March 25th, to hear an account of the winding-up from the liquidator, Mr. A. Neill.

Dissolutions of Partnership.—ROYCE & HOCKING, electrical engineers, 37, Victoria Street, Bristol.—Messrs. J. G. Royce and E. L. Hocking have dissolved partnership. Debts will be attended to by Mr. Hocking.

JOY & HARRISON, consulting engineers, Ulster Chambers, 168, Regent Street, W.1.—Mr. B. C. Joy and Mr. T. C. Harrison have dissolved partnership. Mr. Harrison will continue his practice at Room 602 (the office of the late partnership), and Mr. Joy will carry on his practice at Room No. 514 (both at 168, Regent Street, W.).

Trade Announcements.—THE FALKIRK ELECTRICAL ENGINEERING CO. has opened business as electrical engineers at Chapel Lane, Falkirk.

MESSRS. R. STEVENSON & SONS, 56, Bank Street, Kilmarnock, have opened an electrical department in connection with their business.

The Cardiff office of the CONSOLIDATED PNEUMATIC TOOL CO., LTD., has been removed to 18, Bank Buildings, 98, St. Mary Street, Cardiff. Telephone: "Cardiff 256." Telegraphic address: "Caulking, Cardiff."

MESSRS. FLEMING, BIRKBY & GOODALL, LTD., inform us that from March 1st the designation of the firm will be changed to "Birkbys."

THE MANCHESTER DISTRICT WIRELESS CO., of Agur Street, Bury (Lancs.), has opened showroom premises at the County Bank Buildings, Fleet Street, in that town.

MESSRS. MAYALL & Co., LTD., electrical wholesalers, Birmingham, have recently appointed Mr. E. Bottomley, 23, Mayfield Terrace South, Halifax, as their sales representative for the West Riding of Yorkshire, who will carry stocks of all lighting materials.

MR. H. BURNAGE, of 82, High Street, Ashford (Kent), has opened a department for wireless goods.

MR. W. A. MORTON is opening additional premises at 80, Surrey Street, Sheffield, for electrical accessories business.

MESSRS. ASH & HART, engineers, of 70, Victoria Street, London, S.W., have sold their business to Messrs. Davis, Ash and Co., Ltd., 15, Grape Street, Shaftesbury Avenue, London, W.C.2. Mr. Ash is a director of the new company. Communications regarding the late firm should be sent to Mr. R. J. Hart at 18, Pembridge Gardens, W.2.

A service and repair depôt for car-lighting, engine-starting, and magneto equipment has been opened by MESSRS. HERBERT-SMITH & JONES, LTD., at 1, 2 and 3, Marylebone Passage, Well Street, London, W.1.

Messrs. H. ANDREWS & Co., LTD., George Street, Plymouth, have opened a department for wireless sets and accessories.

Messrs. WATSON & KITCHEN, motor and cycle engineers, are opening a wireless department at 24, King Edward Street,

Leeds, under the charge of Mr. Thos. Marsden, A.M.I.E.E. Catalogues are desired.

Messrs. WRIGHT MOTORS, LTD., of Halifax, have appointed Mr. H. C. Amos, of 22, Martin Lane, Cannon Street, E.C.4, to be their sole London and district representative.

Catalogues and Lists.—MESSRS. HOLLINGS & GUEST, LTD., Thimble Mill Lane, Birmingham.—List No. A. 109, illustrating various types of hydraulic hot-plate presses for embossing, vulcanising, &c.; and List No. A. 110, showing forcing presses for assembling commutators, &c. Both lists are priced.

MESSRS. SIEMENS BROS. & CO., LTD., Caxton House, Westminster, S.W.1.—Pamphlet 820 A, a pamphlet describing "Siemens" thermo-electric pyrometers.

THE EDISON SWAN ELECTRIC CO., LTD., 123-5, Queen Victoria Street, E.C.4.—An illustrated and priced catalogue of dry and fluid cells.

THE STERLING TELEPHONE AND ELECTRIC CO., LTD., 210-212, Tottenham Court Road, W.1.—Publications Nos. 374 A, dealing with radio head telephones; 390, describing loud speakers and amplifiers; and 392, containing testimonials of "Sterling" radio instruments.

MATERIEL ELECTRIQUE ALEX. LEFEBVRE, 9, Rue Arsène-Houssaye, Paris, VIIIe. List No. B. 63, containing details of plant for sale, including complete generating sets, steam and oil engines, motors, &c.

THE ARGSON ENGINEERING CO., LTD., Beaufort Works, Richmond Road, East Twickenham.—A priced and illustrated leaflet and Press cuttings dealing with "Argson" hand- and mechanically-propelled tricycles, &c.

THE HOTPOINT ELECTRIC APPLIANCE CO., LTD., 24, Newman Street, Oxford Street, W.1.—A set of "little 'Hotpoint' men" for shop-window displays.

THE CAMBRIDGE & PAUL INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—A mailing card advertising "Cambridge" thermographs and index thermometers.

MESSRS. WATSON & SONS (ELECTRO-MEDICAL), LTD., Sunic House, Parker Street, Kingsway, W.C.2.—A pamphlet describing a new cathode connection for Coolidge tubes.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Leaflet 97, giving details and prices of "Tangent" tuning coils for radio reception.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Leaflet No. O. 3,184, containing revised prices of "Geeko" accumulators.

Copper and Lead Prices.—Messrs. F. Smith & Co. report February 26th:—Copper (electrolytic) bars, £69 5s., 35s. decrease; do. do. sheets, no change; do. do. wire rods, £79 5s., 35s. decrease; do. do. h.c. wire, 9 15-16d., 3-16d. decrease; silicium bronze wire, 1¾d., ¼d. decrease.

Messrs. James & Shakespeare report February 27th.—Copper bars (best selected), sheet and rod, £97, £2 increase; English pig lead, £37, 15s. increase.

Book Notices.—"Engineering Diary," by J. E. Dodsworth. London: Charles Letts & Co. Price 2s. net.—Within a very small compass this diary contains a great quantity of useful information both on general and engineering matters. While it is not possible to give a list of all the things which it contains, a selection will indicate the nature of the contents. There are addresses of technical institutions, metric conversion tables, heat formulæ and data, physical and chemical facts relating to many materials, &c. The diary is excellently bound, and is provided with a pencil and a plentiful supply of squared and lined paper.

Pitman's "Radio Year-book, 1924." Pp. viii+184; illustrated. London: Sir Isaac Pitman & Sons, Ltd. Price 1s. 6d. net.—This year-book is now in its second year and fourth edition, and may be regarded as fairly launched on its career of usefulness. Necessary additions have been made to bring the tabular matter up to date, and leading men in the industry have contributed a variety of interesting articles on broadcasting and allied subjects. A list of periodical literature containing information on wireless work shows that there are now no fewer than 11 journals dealing exclusively with the subject, all but one of which owe their existence to the introduction of broadcasting into this country. The technical section of the year-book contains a mass of valuable information regarding crystal detectors and valves, batteries, aerials, receivers, condensers, &c., as well as operating instructions and hints to users. A commercial section gives particulars of the Associations that have been formed in the radio trade, a trade directory, and a classified list of manufacturers. A book of this kind is almost indispensable to anyone interested in the subject of "radio," and we anticipate that the year-book will have a wide vogue.

"Newspaper Press Directory for 1924." Seventy-ninth annual issue. London: C. Mitchell & Co., Ltd. Price 5s.

"Cam Design and Characteristics," by F. W. Wright, and "The Design of High-Speed Alternating-Current Generators," by W. Sharp. New Malden: Vizetelly & Co., Ltd. Price 2s. net each.

First German Radio Exhibition.—The first German wireless exhibition is to be held in Hamburg from May 29th to June 2nd. It is organised by the Hamburg Radio Club, at the same time as the German Agricultural Exhibition in Hamburg; 2,000-metre surface space is placed at the disposal of German and Austrian exhibitors, where apparatus and accessories for home consumption and export will be on show.

Wild-Barfield Furnaces.—We are informed by Messrs. Automatic & Electric Furnaces, Ltd., that electrical and mechanical improvements recently introduced in the Wild-Barfield automatic hardening furnace now permit its efficiency to be increased. Whereas the cost of hardening one ton of steel parts with power at 1d. per kW has been 34s., they are now able to reduce this cost to 26s. per ton. This figure includes the period of one hour required for heating the furnace up from cold to the working temperature. In view of these improvements, the firm proposes to give every user of its new automatic hardening furnaces in the United Kingdom a year's guarantee, replacing free of all charge any part of a furnace (other than the safety fuse) which may fail, and if in the course of twelve months from the date of installation there has been no claim made for replacements, the makers are prepared to carry forward the guarantee for another six months.

New Municipal Showrooms.—The accompanying illustration is a view of the interior of the showrooms recently opened by the Birmingham Electric Supply Department at 21, Paradise Street, Birmingham. This picture shows the "Octagon Room," and is taken from the kitchen. In the background can be seen an "Angelus" griller, an electrical four-tier

New Birmingham Showrooms.

"steamer," and a "Tricity" cooker, as well as an electric fan and two totally enclosed lighting fittings. In the foreground is a washer and wringer. Other rooms contain examples of all kinds of appliances which are demonstrated to visitors.

Lead.—In their report dated February 23rd, Messrs. James Forster & Co. state:—"There is little demand from consumers at the moment, the majority having provided against the dock strike with enough metal to keep them going till early March. A fair amount of forward buying has been seen, but consumers, on the whole, are adopting a hand-to-mouth policy in view of the high price of the metal. A fair quantity of lead has been arriving, some of it being held up by the strike, all of which is earmarked for consumers. There has been no Mexican lead since the steamer which arrived on the 2nd inst., and it is said that there will be none before April. If this proves correct we shall have a very difficult time next month if consumption keeps up to the present scale. The advance in prices on Thursday was attributed to the better outlook for a settlement of the dockers' strike and yesterday to the advance in the official American price to 8.70 cents per lb. So long as the market in America maintains its present tone, there is little likelihood of any material set-back in prices here, and any further advance in New York would undoubtedly be reflected in the London market."

French Foreign Trade in 1923.—According to the French Customs returns for 1923, the imports of electrical machinery, cables and apparatus last year amounted to 8,526 tons, of the value of 152,415,000 fr. as compared with 8,243 tons and 117,218,000 fr. in the previous year. The augmentation in the values is attributed specially to the growth in the imports of cables and wire which were trebled, and the imports of dynamos and motors were double those in 1922. On the other hand, the exports in 1923 amounted to 12,764 tons, of the value of 235,296,000 fr., as contrasted with 11,293 tons and 184,832,000 fr. in 1922. Among the exports which were greater in 1923 than in the previous year are mentioned dynamos, glow and arc lamps, armatures, electrical apparatus and porcelain and other insulators.

Swiss Orders from Abroad.—According to statements in Zurich newspapers, the Swiss engineering firms are well employed at present. Messrs. Brown, Boveri and Co. are reported to have orders on hand, among others, for France and Spain, and also for Japan, particularly for motors and high-pressure apparatus. Turbine contracts are on the books of Escher Wyss & Co. for Japan, England and Holland, while the Winterthur Locomotive Works is credited with having orders for electric locomotives for the account of French colonies, and the Oerlikon Machinery Co. for motors and apparatus for France.

British Empire Exhibition Note.—The Preston Electricity Committee is making a contribution of £100 towards the cost of the display of the British Electrical Development Association.

The British Industries Fair.—The Department of Overseas Trade states that responses have been received from 60 per cent. of those to whom invitations to attend this year's fair were sent intimating their intention to be present. Apart from the better-known commercial centres, representatives from Iceland, Ecuador, Chile, Siam, Peru, and Siberia will visit the Fair, and the outlook is very encouraging. The majority of the exhibitors will be those who have displayed their goods at previous Fairs, but it is possible to find room for new firms provided that applications are received in good time. These should be addressed to the Secretary, British Industries Fair, 35, Old Queen Street, Westminster, S.W.1.

Unemployment.—There was a further decrease in the number of persons registered as wholly unemployed during the week ended February 11th, the total being 1,153,600, as against 1,211,900 in the previous week. The total reduction during the present year has been 96,500.

German Lamp Prices Down.—The German lamp makers decided last week to reduce by 13 per cent. the prices of gas-filled metal-filament lamps as from February 15th. As an instance it is stated that the 25-c.p. 220-volt lamp, which is the most used in Germany, has fallen from 2.15 marks, the pre-war price, including the tax, to 1.20 marks, or about 40 per cent.

Australia and Dumping Duties on Electric Motors.—We read in the *Industrial Australian and Mining Standard* of January 3rd that representatives of the Australian Association of British Manufacturers, Siemens Bros., Ltd., Metropolitan-Vickers Electrical Co., Ltd., Australian General Electric Co., Ltd., the British General Electric Co., Ltd., and the Chamber of Commerce, waited on the Tariff Board (Messrs. G. E. Hudson, acting chairman, W. Leitch, and J. Vicars) recently to protest against the imposition of anti-dumping duties on imported electric induction motors. The deputation declared the duties imposed are 27½ per cent. on motors from Great Britain and 40 per cent. on motors from other countries. The landed costs to Australian importers, without allowing them any profit at all, were in almost every instance higher than the corresponding net selling price of the Australian manufacturer. Australian manufacturers were unable to meet the demand for electric motors. If the duties were allowed to remain in existence, they were afraid that users of motors in Australia would suffer, and the services of a number of employés would have to be dispensed with, because importers would not be able to do business. Mr. Hudson, in reply, said that he would like to remind the deputation that for every article imported from Great Britain on which a duty was imposed, 20 articles from foreign countries were made dutiable to protect British manufacturers. The board would not impose the duties on motors that could not be made in Australia. In view of the fact that induction motors were manufactured on a large scale in Australia, and that the Customs tariff provided protection for the makers, the board could not do otherwise than apply Section 4 of the Industries Preservation Act when similar motors were sold to buyers in Australia at less than the price in the country of export. "The Act compels the board to apply the anti-dumping duties provided," concluded Mr. Hudson.

The Flat Rate on Coal.—The Railway Rates Tribunal has concluded its inquiry into the application of the Mining Association of Great Britain, and the National Association of Coke Oven and By-Product Plant Owners for the abolition of the flat rate of 2d. per ton upon coal carried by the railways. The applicants stated that this abolition would act as a stimulus to industry; and it would not injure the railway companies, as it would lead to a growth in traffic. It was said that a 5 per cent. increase in traffic would compensate the companies for the loss of the flat rate. On the other hand, the railway companies contended that an increase of between 20 and 25 per cent. would be needed to effect this. The judgment of the Tribunal may not be promulgated for some time.

Enamelled Signs.—The GENERAL ELECTRIC CO., LTD., is now issuing to dealers two enamelled iron signs advertising "Osram" lamps.

Italian Cables for America.—The firm of Pirelli, of Milan, has recently been successful in America in securing good orders for cables from the New York Edison Co., the Edison Electric Illuminating Co., of Boston, and the Commonwealth Edison Co., of Chicago. The order of the first-named company was for 25 km. of three-phase cable 3 x 175 mm.² and 3 x 250 mm.², for working pressures of 27,000 and 46,000 volts. The other two companies ordered respectively 3 and 6 km. three-phase cables for 36,000 volts. According to Mr. D. W. Roper, of the Edison Company, the Italian cables, from a technical point of view, compare favourably with similar American products.

The Electrical Development Association.—The annual general meeting of the British Electrical Development Association will be held on Friday, March 21st, at the Hotel Cecil, at 12 o'clock noon. The annual luncheon will follow at 1 p.m. Tickets for the luncheon can now be obtained, price 12s. 6d. each, including wines, at the B.E.D.A. offices, 15, Savoy Street, Strand, London, W.C.2.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections may be entered against any of the proposed marks within one month of the dates mentioned. In the case of foreign applications, the names and addresses of the British representatives are also given:—

Fairbanks-Morse. No. 431,685. Class 6. Dynamos, electric motors, &c.—Fairbanks, Morse & Co., 900, South Wabash Avenue, Chicago, U.S.A. (Mewburn, Ellis & Co., 70-72, Chancery Lane, London, W.C.). February 20th, 1924.

Wecovalve. No. 437,075. Class 8. Thermionic valves.—The Western Electric Co., Ltd., London, W.C. February 20th, 1924.

Fourplex. No. 441,385. Class 8. Wireless telegraphy receiving apparatus.—The Sterling Telephone and Electric Co., Ltd., London, W.1.

Threeflex. No. 441,386. Class 8. Wireless telegraphy receiving apparatus.—The Sterling Telephone and Electric Co., Ltd., London, W.1. February 20th, 1924.

Mullard Co. radio valve (lettering and design). No. 442,026. Class 8. Thermionic valves.—The Mullard Radio Valve Co., Ltd., London, S.W.12. February 20th, 1924.

Spinet. No. 442,552. Class 8. Apparatus for use in wireless telephony and parts thereof.—Hart Collins, Ltd., London, S.W.1. February 20th, 1924.

Youngs (Glasgow), Limited, Okay (lettering and design). No. 443,303. Class 8. Detector crystals and apparatus and instruments for use in wireless telegraphy and telephony.—Youngs (Glasgow), Ltd., Glasgow. February 20th, 1924.

Scorpio. No. 444,090. Class 8. Electric cables and flexibles covered with vulcanised india-rubber.—Plant & Supplies, Ltd., London, W.C. 2. February 20th, 1924.

Ampliton. No. 444,156. Class 8. Telephonic apparatus.—Edward A. Graham, trading as Alfred Graham & Co., London, S.E.4. February 20th, 1924.

Amplicon. No. 444,157. Class 8. Telephonic apparatus.—Edward A. Graham, trading as Alfred Graham & Co., London, S.E.4. February 20th, 1924.

Globite. No. 444,541. Class 8. Detector crystals for use in wireless telegraphy and telephony.—Hugh L. Corby, trading as the Globe Wireless Co., 4, Cavendish Road, Colliers Wood, London, S.W.19. February 20th, 1924.

J. R. (lettering and design). No. 444,262. Class 8. Apparatus for use in wireless telegraphy and telephony.—Jean Rigaut, 108, Euston Road, London, N.W.1. February 20th, 1924.

Miniwatt. No. 442,870. Class 11. Röntgen-ray tubes, X-ray apparatus, electro-medical lamps, vacuum tubes, and electron discharge apparatus. — Naamlooze Venootschap Philips Gloeilampenfabrik, Eindhoven, Holland (Boult, Wade and Tennant, 112, Hatton Garden, London, E.C.). February 20th, 1924.

T. (lettering and design). No. 428,919. Class 13. Electrical fittings and accessories.—The Trumbull Electric Manufacturng Co., Plainville, Conn., U.S.A. (Francis H. Rogers, Bridge House, 181, Queen Victoria Street, London, E.C.). February 20th, 1924.

Atlantic. No. 430,820. Class 13. Motor lamps, horns, bulbs, and plug boxes.—Butlers, Ltd., Atlantic Works, Birmingham. February 20th, 1924.

For Sale.—Gellygaer Urban District Council Electricity Department has for disposal one 5-kW generating set and one 54-cell Tudor battery, with charging and distribution panel. The Officer-in-Charge, R.E. Stores, Chilwell, Notts., invites offers for surplus motors, stores, &c. Messrs. George Cohen and Armstrong Disposal Corporation invite offers for surplus steam and motor generating sets, motors, lifting magnet, &c. By order of Messrs. Mann, Egerton & Co., Ltd. (owing to removal to new premises) Messrs. Bromhead & Co. will offer by auction on March 6th and 7th, at 173-175, Cleveland Street, W., the whole of the stock-in-trade of electrical and gas supplies, including electric cable, electroliers, &c. (See our advertisement pages to-day.)

Yarrow Boilers.—Owing to the rapid development of the Yarrow boiler for power-station work, it is of interest to note that arrangements have been made between Messrs. Yarrow and Co., Glasgow, and the De Schelde Company, Flushing, Holland, by which the latter firm is now making the Yarrow (land type) boiler, and an order has already been received for an installation of Yarrow boilers for the central power station at Geertruidenberg, Holland.

Rails for South Africa.—Replying to a question in the Union House of Assembly on February 22nd, Mr. Jagger, Minister of Railways, stated that the railway administration had placed the following orders for rails with Continental firms:—Krupp and Bochumer Verein, 80 lb. rails at £6 18s. 6d. per ton, total £87,048. Two Belgian firms, 45 lb. rails at £6 12s. per ton, total £18,202. French firms, 60 lb. rails at £6 7s. 6d. per ton, total £42,075. The lowest British tenders for the same requirements were at the rate of £8 12s. 3d., £9 5s., and £8 15s. per ton respectively. The complete order would have cost £191,520 if placed in Great Britain, compared with £147,325 as placed on the Continent. That showed that British tenders were roughly 30 per cent. higher. An order for wheels and axles had also been placed with Krupps, whose tender was £7,733 lower than the lowest British one. Mr. Jagger added that he had just received a cable intimating British offers which were the lowest tender—that showed the effect of competition.—*Reuter* (Cape Town).

Lighting and Power Notes.

Ashton-under-Lyne.—New Plant.—Owing to increased applications for electricity having been received, the Town Council proposes to install rotary converters, and to transmit current from the central generating station to sub-stations. The cost of the new mains is estimated at £1,300; sub-stations £6,000, including the machinery; and other h.p. mains £2,700. Sanction to the borrowing of £10,500 is being applied for. It is proposed to put down two sub-stations, each of which will be equipped with 300-kW rotary converters. Current will be transmitted from the generating station at a pressure of 6,000 V, and stepped down to 500 V.

Bedford.—New Plant.—The Town Council is to install a new 3,000-kW set at the electricity works at an estimated cost of £21,000.

Bingley.—Street Lighting.—The Urban District Council has decided to adopt a system of automatic lighting of the public lamps at an estimated cost of £4,000.

Birkenhead.—New Plant.—The Tramways and Electricity Committee has appointed a special sub-committee to consider the provision of additional generating plant.

Bredbury and Romiley.—Electricity Order.—The Urban District Council has applied to the Electricity Commissioners for an Order authorising it to supply electricity in the district, and, subject to satisfactory terms of agreement, to appoint Mr. Ralph Lomax, of Stockport, as engineer, to carry out the scheme. On the Order being obtained, sanction to a loan of £13,650 is to be applied for to carry out the scheme.

Bromley (Kent).—Electricity Charges.—The residents of Bromley and Chislehurst are organising a petition to the Ministry of Transport protesting against what they allege is an increased charge of from 100 to 180 per cent. for electricity. The district is supplied by the Bromley Electric Light & Power Co., Ltd., and the charge for lighting is 9d. per kWh.—*Daily Mail.*

Carlisle.—New Power Station.—The City Council has received the sanction of the Electricity Commissioners to the erection of the proposed new power station at Willow Holme, and the Unemployment Grants Committee has approved of a grant of 50 per cent. of the interest on the loan raised to meet the expenditure on the scheme not exceeding £233,882. Application has been made to the Electricity Commissioners for sanction to the borrowing of £1,838, for the erection of three sub-stations.

Ceylon.—Hydro-Electric Scheme.—A modified hydro-electric scheme for Ceylon which the local government has for some time past been considering has been favourably reported upon by Mr. Parry and Mr. Preece. The scheme is estimated to cost Rs. 10,000,000.—*Indian Textile Journal.*

Continental.—Italy.—La Società Elettrica Alto Adige has lately been formed to exploit several water power concessions in the Upper Adige district, where large generating stations are to be established.

France.—The hydro-electric station at the Ponale waterfall, owned by the Town Council of Rovereto, after a period of eight years' inactivity, has again been brought into full working order. Built in 1905, it was partly blown up and wrecked in the early days of the war.

Corwen.—Breakdown.—A breakdown occurred at the electricity works of the Corwen Electric Light Co., Ltd., on February 18th, and the electricity supply in the district was cut off for the whole day.

Dumfries.—Loan.—The Town Council has applied to the Electricity Commissioners for sanction to the borrowing of £7,000 for mains, and for the erection of a sub-station.

East Anglia.—Draft Special Order.—The Electricity Commissioners have issued a draft Special Order for the "East Anglian" area, embracing parts of Norfolk, Suffolk, and Essex. The maximum price is fixed at 1s. per kWh. The undertakers are East Anglian Electricity, Ltd., of Felixstowe.

East Ham.—Loans Sanctioned.—The Town Council has received the sanction of the Electricity Commissioners to a loan of £6,000 for mains extensions, and also for £2,640 for new equipments for tramcars.

Glasgow.—Proposed New Power Station.—The Electricity Committee has recommended to the Corporation that a site be purchased on the Blythswood estate for the erection of a large power station. It is estimated that in 10 years the station at Dalmarnock will be working at full capacity.

Guisborough.—Special Order.—The Urban District Council is applying to the Electricity Commissioners for a Special Order authorising it to supply electricity to the district.

Hemsworth.—Special Order.—Application has been made to the Electricity Commissioners by the Rural District Council for a Special Order authorising it to supply electricity in the rural district.

Harrogate.—Electricity Agreement.—The draft agreement in connection with the proposed supply of electricity to Knaresborough Urban District Council has been approved by that authority, and the Town Council is applying to the Electricity Commissioners for sanction to the agreement.

Ilkley.—Loan Sanctioned.—The Electricity Commissioners have sanctioned the borrowing by the Urban District Council of £6,596 for transformer plant in connection with the scheme for obtaining a bulk supply of electricity from the Yorkshire Electric Power Co.

Inverness.—Purchase of Undertaking.—At a recent meeting of the Town Council a resolution was passed that the Council should notify the North of Scotland Electric Light and Power Co., Ltd., of its intention to purchase the company's electricity undertaking at the expiration of one year.

Irish Free State.—Mill Street (Co. Cork).—The Rural District Council has decided to convene a public meeting of the townspeople to consider the proposed scheme for an electricity supply for the district.

Parliamentary Bill.—President Cosgrave has introduced a Bill in the Dail Eireann authorising certain statutory undertakings for the supply of electricity in the Irish Free State to continue temporarily as from August 31st, 1923, the increases heretofore authorised in the charges made, and to provide for the revision from time to time of the charges made by such undertakings and by other similar undertakings in the Free State. Mr. Cosgrave said that the former Bill in relation to this matter had lapsed, and this new Bill would be made retrospective, with a reservation that an examination might be made as to the reasons for the increased charges by the Ministry of Industry and Commerce, and would continue to December 31st, 1924, certain orders made under the Act regulating an increase in price.

Dublin.—At a recent meeting of the Executive Committee of the Dublin Citizens' Association it was decided to oppose the Corporation's proposal to obtain powers in connection with the Liffey hydro-electric scheme.

Dundalk.—At a recent meeting of the Urban District Council it was intimated that the Free State Ministry of Industry and Finance had sanctioned the Council's application for a further loan of £2,000 for electricity extensions.

Kirkwall.—Inauguration of Supply.—The electricity undertaking was formally inaugurated on February 18th. The work has been carried out under the supervision of Mr. James Liddle, of Edinburgh, and the cost was £10,000.

Lincoln.—Electricity Supply.—At the last meeting of the City Council it was reported that the electricity extension scheme had been completed, and that the accounts showed an expenditure of £403,173. The receipts had amounted to £387,388, and it was decided to obtain a further loan of £8,500.

Loan.—The Town Council is applying to the Electricity Commissioners for sanction to a loan of £21,600 for electricity purposes, including £10,600 for mains, £2,750 for meters, £2,450 for a new inlet to St. Swithin's power station, £1,800 for sub-stations, and £1,500 for electric cookers.

Liverpool.—Electricity Extensions.—The City Council has appointed a special committee to go into the question of the provision of additional generating plant. The chairman of the Tramways and Electric Power and Lighting Committee stated that the Electricity Commissioners had sanctioned the extension of the Lister Drive station, and had stipulated that the Corporation should give attention to the establishment of a new riverside generating station. The estimates of the Committee provide for an expenditure from capital account of £302,500 on underground mains, and £760,750 for plant and buildings, including a new power station at Lister Drive.

London.—St. Pancras.—The Electricity Committee has recommended that application be made to the Electricity Commissioners for sanction to the expenditure of £20,000 for plant suitable for the introduction of the pulverised fuel system at the King's Road power station.

Hammersmith.—The Electricity Committee has submitted to the Finance Committee for approval a recommendation that the three-phase main from Wood Lane Arch to the Scrubbs Lane sub-station be completed at an estimated cost of £24,069. The Electricity Committee has also recommended to the Borough Council that the charge for electricity through prepayment meters be reduced from 7d. to 6d. per kWh.

Electricity Charges.—The Highways Committee of the London County Council has recommended to the London County Council that representation be made to the Ministry of Transport that the maximum price for electricity charged by the Notting Hill Electric Lighting Co. (Ltd.) be reduced to 6d. per kWh. The present authorised maximum charge is 8d. per kWh, and the charge for lighting is 7d. per kWh.

A special committee has been appointed by the London Chamber of Commerce to consider what steps can be taken to obtain a reduction in the charges for electricity in the City.—*The Times.*

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

Blackburn.—Lighting: From 7d. to 6d. per kWh. Power: 2½d., 2¼d., 1½d., 1¼d., ¼d., and ¾d. per kWh, according to quantity consumed. Domestic power: 2d. per kWh. Rateable value system: Houses with a rateable value of £15 are

charged a fixed rate of £3 per annum, with £1 additional for each £5 additional rateable value, plus 2d. per kWh, and for houses over £70 a charge of 20 per cent. per annum, plus 2d. per kWh.

MENAI BRIDGE.—Lighting: A reduction of 20 per cent.

LONDON.—*Charing Cross Electricity Supply Co., Ltd.*—West-End districts. Lighting: 7d. per kWh for the first 16 kWh per 300 watts installed per annum (instead of 20 as hitherto). All energy in excess of this amount from 4d. to 3d. per kWh. Power: From 2½d. to 1½d. per kWh.

MEXBOROUGH.—Lighting: From 7d. to 6½d. per kWh. Power: From 75 per cent. to 50 per cent. above the pre-war rate.

Radcliffe (Lancs.).—LOAN.—The Urban District Council is applying to the Electricity Commissioners for sanction to the borrowing of £2,037 for the erection of a sub-station.

Redcar.—ELECTRICITY SUPPLY.—It is expected that a system of electric lighting will be installed in the borough by July. At a recent meeting of the Town Council it was decided that, when the Corporation's Electricity Order was confirmed by Parliament, application should be made for a loan not exceeding £22,000 to defray the cost of establishing and carrying on the electricity undertaking for three years.

Northern Ireland.—PORTSTEWART (LONDONDERRY).—At a recent meeting of the Urban District Council it was decided to purchase the local electricity undertaking, and application is to be made to the Electricity Commissioners for Northern Ireland for an Order authorising the Council to carry this into effect.

Preston.—STREET LIGHTING.—The Electricity Committee has instructed the electrical engineer to prepare a scheme for lighting the main streets of the borough by electricity.

Richmond (Yorks.).—ELECTRICITY SUPPLY.—A special committee which was appointed by the Town Council to consider the question of an electricity supply has reported in favour of a scheme, and the Town Council is to obtain the services of a consulting engineer to prepare one.

Sheffield.—ELECTRICITY EXTENSIONS.—The City Council has approved the expenditure of £50,000 during the present financial year on buildings and plant at the Blackburn Meadows generating station. The Electricity Committee has approved electricity extensions and works at an estimated cost of £7,779.

Swinton (Lancs.).—LOAN.—The Urban District Council has applied to the Electricity Commissioners for sanction to a loan of £10,000 for the purpose of supplying electricity to houses being erected in the Mooreside Road district.

Truro.—ELECTRICITY AGREEMENT.—The joint agreement submitted by the Town Council and the Cornwall Electric Power Co. for a supply of electricity to the town has received the formal approval of the Electricity Commissioners.

Tunbridge Wells.—EXTENSION OF SUPPLY.—The Electricity Committee is considering the supply of electricity to Penshurst, and a bulk supply to a large district, including Goudhurst, Cranbrook, Hawkhurst, &c.

Westgate and Birchington.—SPECIAL ORDER.—The Isle of Thanet Electric Tramways & Lighting Co., Ltd., is applying to the Electricity Commissioners for a Special Order authorising it to supply electricity in the districts.

Wolverton.—ELECTRICITY ORDER.—The Urban District Council has decided to give its consent to the application of the Northampton Electric Light & Power Co. for a Special Order to supply electricity in the Council's area.

Tramway and Railway Notes.

Bradford.—FARES.—The Corporation Tramways Committee last week considered a report by the General Manager (Mr. B. H. Wilkinson) on the subject of tramway fares. He states that it is advisable to continue the pass system, but that penny fares are not yet practicable, owing to the high cost of maintenance of the services, and particularly of the tramway tracks. The tramway receipts show an increase of £100 per week since the introduction of the passes. The Committee adjourned consideration of the whole matter for a fortnight.

Continental.—FRANCE.—The new electric engines of the Midi Railway have given, on trial, every satisfaction. Planned for a normal speed of 90 km., the train easily attained to 100 km. per hour. The trials of the new high-speed engines also gave the best results. The heavy trial train of 300 tons attained a speed of 100 km. in three minutes, and rose without difficulty to 128 km. This speed is the highest hitherto recorded in Europe for an electric train of this weight.

SWITZERLAND.—The Federal Finance Department is negotiating for a loan of 150,000,000 fr. for Swiss railway electrification purposes.

EXETER.—PROPOSED EXTENSIONS.—The Tramways Committee has submitted to the Town Council a report on proposed tramway extensions. The estimated cost of laying a single track to Hamlyn Lane is £5,200, and a double track £7,992. The construction of a double track from Cemetery Road to Beacon Lane would cost £9,620, or a single track with three passing places, from Cemetery Lane to Summer Lane, £14,058.

London.—BANK UNDERGROUND STATION IMPROVEMENTS.—Work on the installation of escalators at Central London Railway Station at the Bank is nearing completion. It is also intended to install "passimeters," "automaticket," and change-giving machines. When the work is completed the journey from the street to the trains will be possible in 1¼ minutes, as against 2¼ minutes before the alterations were commenced, in addition to which it will be possible to deal with 50 per cent. more passengers each day.

OPENING OF MORNINGTON CRESCENT JUNCTIONS.—The linking-up of the Hampstead and City and South London Railways has just been completed so far as the construction of the inter-connecting tunnels is concerned. Work is now being pushed forward with the track-laying and installation of the necessary electrical and signalling apparatus. When the reconstruction of the City and South London Railway is completed trains will be run from either Highgate or Edgware to Charing Cross, or *via* Euston to Clapham Common, and eventually on to Morden. Another junction is to be made later at Charing Cross, linking up that station with Waterloo and Kennington, at which point there will be exchange with the City and South London. One of the new tunnels will be put into operation at once. The north-bound line between Mornington Crescent and Camden Town, which has been used by Golder's Green trains since the opening of the line in June, 1901, will be switched over to the new tunnel.

OPPOSITION TO L.C.C. BILL WITHDRAWN.—The Corporation of London has withdrawn its petition against the London County Council's Bill to extend its tramways over Southwark Bridge.

Northampton.—ALLOCATION OF PROFITS.—Having made a profit of £9,000 on the tramway undertaking, the Corporation is contributing £7,000 toward the relief of the rates.

Parliamentary Bills.—According to the *Manchester Guardian* the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board has decided to petition against the Ashton Corporation and Manchester Corporation Bills. With regard to the Manchester Bill it is stated that the Board wishes a clause to be inserted to safeguard it against the Manchester Corporation's entering into its area without its consent.

Salford.—CONTRIBUTION TO RATES.—The Tramways Committee has decided to contribute an additional £10,000 from the current year's profits towards the relief of the rates.

Stoke-on-Trent.—ACCIDENT.—A tramcar belonging to the Potteries Electric Traction Co. left the metals while descending a steep gradient, and ran into a wall. The front of the car was completely wrecked, and a number of passengers were injured.

Sunderland.—TRAMCAR IMPROVEMENTS.—The Corporation, at a total cost of £3,800, is to convert three single-deck cars into double-deck top-covered cars with new electrical equipments fitted to each, and to fit six double-deck cars with new sets of controllers, at a cost of £3,800, which is to be borne out of revenue.

Telegraph and Telephone Notes.

Canada.—TELEPHONE PROFITS.—The gross earnings of the Bell Telephone Co. of Canada for the year ending December last were 22,225,000 dollars, showing an increase of nearly 2,000,000 dollars on the amount for last year. The net earnings were 4,877,000 dollars, an increase of 900,000 dollars on the 1922 figure. Fifty-two thousand new telephones were installed during the year.—*Reuter* (Ottawa).

TELEGRAPH RATES.—The Canadian National Telegraph Department announces that it will cut the rate to 18 cents a word, full rate, and 8 cents a word, deferred rate, being a reduction of 7 cents and 2 cents a word respectively. The reduction applies to all sections of Canada east of Manitoba.—*Reuter* (Ottawa).

Cape Verde Islands.—NEW CABLE STATION.—*The Times* Lisbon correspondent states that the Government has authorised the erection of a cable station in Cape Verde Islands by an Italian company.

Imperial Radio Communication.—COMMITTEE'S REPORT.—The Committee appointed by the Postmaster-General to advise him, without delay, on the policy to be adopted as regards the Imperial wireless services has completed its work. On February 20th the draft report was submitted to the Postmaster-General. The report has been presented with remarkable celerity. The Committee sat for the first time on February 8th, though the appointment of the Committee was not notified officially until the following Monday. It was arranged that each member of the Committee should deal at once with the particular aspect of the subject with which he was concerned, and the result of the individual investigations was embodied in the draft report of the chairman.

The report itself is understood to be short, though it contains important recommendations as to future policy, but it is accompanied by a number of valuable appendices. If the Government accepts the recommendations, legislation will be required, and it is hoped that it may be possible to pass the necessary Bill within the next six weeks.—*The Times.*

The daily Press understands that the main recommendation of the Committee is that the control of Imperial radio stations should be taken over by the Government, leaving the services to foreign countries to private enterprise.

New Western Union Cable Ship.—LAUNCHED IN FRANCE.—With the breaking of the traditional bottle of champagne against the bows, the new cable ship *Cyrus Field* was launched for the Western Union Telegraph & Cable Co., of New York, at the dockyard of Saint-Nazaire-Penhoet last week, in the presence of a brilliant throng of guests, amongst whom were Captain J. James, attaché of the American Embassy; Vice-President Pendleton, of the American Chamber of Commerce in Paris; Mr. S. Goddard, Vice-President of the Western Union Co., London; and many others. The new vessel is stated to be quite a new departure in cable steamers, and is 64.30 m. long, 10.55 m. wide, and 5.64 m. deep, and has a gross tonnage of two thousand tons.

Portugal.—RATES INCREASE.—A decree has just been published raising inland postal, telegraph, and telephone charges by about 50 per cent.; foreign rates have only lately been raised.—*Reuter* (Lisbon).

Radio Notes.

Ceylon. — BROADCASTING. — Broadcasting took place at Colombo on February 22nd for the first time in the history of the Colony.—*Reuter.*

Educational Broadcasting.—GLASGOW EXPERIMENT.—Glasgow Education Authority has approved of the use of broadcasting in education, whereby lectures would be transmitted from Glasgow and received in schools in the Glasgow area. It is expected that, in the majority of cases, the whole or the greater part of the cost of installation will be borne by the schools themselves. The apparatus, made up or partly assembled in the schools, is not estimated to cost more than £10 in each case. The proposal is that lectures will be broadcast only one day per week, between 3 p.m. and 4 p.m., and can therefore be given without any real interference with the time-table. The first experimental demonstration was to take place on the 26th inst.—*The Times.*

Radio-Broadcasting. — EXPERIMENTAL LICENCES.—In the course of a lecture on "Condensers and Grid Leaks," which he delivered on February 21st, before the Bradford Wireless Society, Mr. Philip Coursey (hon. secretary of the Radio Society of Great Britain) commented on the attempt that is being made to pass a Bill in Parliament which would, he said, not make things any easier for the experimenter. There had been attempts to withdraw the right to hold experimental licences at all, and certainly in future it was likely to be a very difficult matter to gain such permits. The Radio Society was preparing a campaign to counteract the attempts referred to.

RECEPTION ON TRAINS.—As the outcome of a series of tests made on the Great Western Railway last week, the possibility of listening to broadcasting stations in this country by means of an indoor aerial while travelling by train at a high speed has been established. A six-valve set was installed on the Paddington to Birmingham express, and, 40 miles from London and at a speed of 80 miles an hour, the results were good, being clearly heard from a loud speaker above the noise of the train. Sixty miles from London a change-over was made to pick up Birmingham, and this was accomplished with equal success.—*The Times.*

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the* ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)

Open.

Australia.—MELBOURNE.—March 19th. Victorian Railways. Alternating-current induction motors, starting apparatus, and accessories.*

April 2nd. Metal- and carbon-filament lamps for electric train lighting.*

March 10th. State Electricity Commission. 100,000-V testing transformers. (February 22nd.)

SYDNEY.—April 9th. N.S.W. Government Railways and Tramways. Electric overhead travelling crane. Ref. 13,139/ED/EC2.*

May 21st. Electric railway car equipments.*

March 6th. Postmaster-General's Department. Protectors, terminals, and jumper wire.*

Barrow-in-Furness.—March 17th. Electricity Department. One water-tube boiler, with two chain or travelling grate stokers; removal and re-erection of two Babcock & Wilcox boilers; e.h.p. steel cubicle switchgear; one automatic voltage regulator. (See this issue.)

Bedford.—March 14th. Electricity Department. E.h.p. h.p. and l.p. underground cables for 12 months. (See this issue.)

Belfast.—March 10th. Electricity Department. Supply and laying of e.h.p., 3-phase cables, and the supply and erection of 1,000-kW rotary converters, with transformers, switchgear, &c. (February 15th.)

Supply of materials for 12 months, commencing April 1st, including electrical accessories, street-box frames and covers, stoneware troughing and conduits, feeder and section pillars, cable connectors, meters, transformers, cables, joint boxes, &c. (February 22nd.)

Belgium.—March 12th. The Belgian Post and Telegraph authorities at La Salle Madeleine, Brussels. 200 magneto generators. Particulars (Cahier des Charges Special No. 774) for 2 fr.

March 5th. Belgian State Railway authorities (Office de l'Electricité), 25, Rue de las Charité, Brussels. 695 metres of armoured cable, 35 terminal boxes, and a quantity of insulating material. Particulars (Cahier des Charges Special No. 1,381) for 1 fr.

March 14th. Municipal authorities of Petit Spauwen (Province of Liége). Establishment of a low-pressure electricity distribution system in the communes of Hoelbeek and Waltwilder. Particulars for 20 fr.

Bexley.—Urban District Council. Electricity Department. Supply and installation of a 33,000-V, 3-ph. main transmission line consisting of 3,300 yd. of .15 three-core cable in duplicate. (See this issue.)

Blackburn.—March 12th. Installation of electric lighting in Blackburn Orphanage, Wilpshire. Particulars from secretary.

Croydon.—March 3rd. Electricity Department. E.h.p. switchgear; cooling towers and ponds; and cast iron circulating piping. (February 15th.)

Dover.—March 6th. Harbour Board. Electrical sundries and cables for 12 months. Mr. Rutley Mowll, registrar, Castle Street.

East Ham.—March 10th. Electricity Department. Two 1,000-kW converters, one lighting feeder booster, one l.p., d.c. switchboard, two 6,600-V switchgear panels, e.h.p. and l.p. cables, and water-cooling plant. (February 22nd.)

Edinburgh.—Education Authority. Work, including electric lighting, in connection with new elementary school, James' Place, Leith. Schedules from Mr. J. M. Johnston, architect, 47, Charlotte Street, Leith. Tenders to Mr. John Stewart, S.S.C., executive officer, Education Offices, Edinburgh.

March 10th. Electricity Department. One 1,500-kW and two 500-kW converters. (February 15th.)

Egypt.—CAIRO.—March 25th. Ministry of the Interior. Pumping plant, including pumps, tubing, electric motors, transformers, switchboards, cables, &c. Ref. 12,491/FE/EC(2).

April 17th. Electric power station and distributing system.*

Falkirk.—Electric lighting work in connection with 52 houses at Thornhill site. Specification, &c., from Mr. A. Balfour Gray, Town Clerk.

Electric lighting work in connection with housing scheme (second development, 80 houses). Written application to Mr. Wm. Gibson, Director of Housing, Arbotdale, Falkirk.

Fife.—March 11th. Education Authority. Electric lighting in connection with extensions at Education Offices at Wemyssfield, Kirkcaldy. Schedules from Education Office.

Grimsby.—March 3rd. Electricity Department. One 2-ton electric lorry. (February 22nd.)

Halifax.—March 4th. Electrician's work in connection with 48 houses in Nursery Lane, and 62 at Booth Town. Borough Engineer, Crossley Street, Halifax.

Hornsey.—March 14th. Electricity Department. One 15-ton crane. (See this issue.)

Hull.—Corporation. Installation of electric lighting and fittings at the Cottingham Castle estate new fever block. Particulars, city architect's office, Hull.

Leeds.—March 4th. Tramways and Highways Department. Miscellaneous materials, including (Sch. 12a) copper bonds; (Sch. 13a) electrodes. Mr. J. B. Hamilton, commercial manager, 1, Swinegate, Leeds.

March 20th. Electricity Department. One 12,000-kW turbo-alternator set, and steam turbine-driven surface condensing plant. (February 15th.)

Liverpool.—Electrical installation, St. Faith's Parish Hall, Waterloo. Particulars from Mr. S. R. Taylor, 48, Stanley Street, Liverpool.

London.—SOUTHWARK.—March 20th. Board of Guardians. Installation of electric lighting at the Newington Institution. (See this issue.)

Motherwell.—The Town Council is shortly inviting tenders for works, including electric lighting, in connection with the erection of 36 houses. Schedules from Town Clerk.

Southport.—Corporation. Electrical installation at underground conveniences, Lord Street. Specification, &c., from borough electrical engineer, Electricity Works, Eastbank Street, Southport.

Stoke-on-Trent.—March 12th. Electricity Department. Neutral earthing resistance; three steam turbine-driven feed pumps; 600-Ah secondary battery. (February 15th.)

Trowbridge.—March 27th. Trowbridge and Melksham Union. Electric lighting installation at the Institution, Semington, Trowbridge. (See this issue.)

Uruguay.—MONTEVIDEO.—April 30th. State Electricity Supply Works. Six generating sets, complete with accessories and spares, consisting of Diesel oil engines and generators directly coupled.*

West Ham.—March 17th. Education Committee. Electrical wiring for 12 schools. (See this issue.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—It is officially announced, says *The Times*, that the High Commissioner for Australia has placed orders in England for the supply of approximately £214,000 worth of copper and bronze wire for the Commonwealth Post and Telegraph Department. The wire, it is stated, could have been obtained some thousands of pounds cheaper on the Continent, but following the policy adopted now for many years of giving preference to Empire products, the Commonwealth Government has placed the contract with British manufacturers.

Congleton.—Board of Guardians. Accepted:—
Installing electric lighting at the Institution, including engine, dynamo, batteries, switchboards, &c. (£540).—Messrs. Richards.

Glasgow.—Tramways Committee. Accepted:—
Steel tubing for ducts.—Stewarts & Lloyds, Ltd.; and Scottish Tube Co., Ltd.
Commutators.—P. R. Jackson & Co., Ltd.
Air brakes.—Westinghouse Brake & Saxby Signal Co., Ltd.

Electricity Committee. Recommended:—
Coal-handling plant for No. 3 boiler house at Dalmarnock power station (£3,850).—Strachan & Henshaw.
Screening plant in connection with condensing-water inlet at Dalmarnock power station (£3,130).—F. W. Brackett & Co., Ltd.
25-ton travelling crane at Virginia Street sub-station (£875).—John Grieve and Co., Motherwell.

Government Contracts.—The following Government contracts were placed during the month of January:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.
Accumulators.—London Battery & Cable Co., Ltd.
Amplifiers.—H. W. Sullivan, Ltd.
Batteries.—Chloride Electrical Storage Co., Ltd.
Cells.—London Battery & Cable Co.; Fuller's United Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Premier Accumulator Co., Ltd.
50-kW motor booster, control gear, &c.—English Electric Co., Ltd.
100-kW motor generator, with starter and switchgear.—General Electric Co., Ltd.
Electromersible pump.—J. S. White & Co., Ltd.
Resistances.—Bertram Thomas.
Starters and resistances.—Watford Electric & Manufacturing Co., Ltd.
Electrically-driven winches.—Cowans, Sheldon & Co., Ltd.

WAR OFFICE.
Electric cells.—Edison Swan Electric Co., Ltd.; Fuller's United Electric Works, Ltd.; Siemens Bros. & Co., Ltd.
Crucibles.—Morgan Crucibles Co., Ltd.
Electric cable.—Western Electric Co., Ltd.; W. T. Glover & Co., Ltd.; Hooper's Telegraph & India Rubber Works, Ltd.; Johnson & Phillips, Ltd.
Electric meters.—Ferranti, Ltd.
Generators.—Douglas Motors, Ltd.
Lighting and starting sets for lorries.—S. Smith & Son, Ltd.
Power units and spares.—Douglas Motors, Ltd.
Hydraulic electric pump.—Hydraulic Engineering Co., Ltd.
Transformers.—Newton Bros., Ltd.
Electric lighting installations.—Cowley Barracks, Oxford: Alpha Engineering Co. Fulwood Barracks, Preston: Devereux Moodie & Co. Chatham Barracks: Drake & Gorham, Ltd. Norton Barracks, Worcester: A. E. Ludlow & Co. Maidstone Barracks: Malcolm & Allan, Ltd. Queen's Barracks, Perth: Munro & Miller, Ltd. Glencorse Barracks: Munro & Miller, Ltd. Queen Victoria School, Dunblane: Ponsford and MacHardy. Ayr Barracks: Steel & Wilson. Reading Barracks: G. E. Taylor & Co.

AIR MINISTRY.
L.I. attachments for amplifiers.—H. W. Sullivan, Ltd.
Electric cables.—London Electric Wire Co. & Smiths, Ltd.
W/T. condensers.—H. W. Sullivan, Ltd.; Telegraph Condenser Co., Ltd.
D.c. motors for pumps.—Electric Construction Co., Ltd.
Electric fans.—Metropolitan-Vickers Electrical Export Co., Ltd.
Generators.—Newton Bros. (Derby), Ltd.; Small Electric Motors, Ltd.
Magnetos.—British Thomson-Houston Co., Ltd.
Motor alternators.—Crompton & Co., Ltd.
Petrol-electric generating sets.—Norman Engineering Co., Ltd.
W.T. valves.—General Electric Co., Ltd.

POST OFFICE.
Telegraph apparatus.—Muirhead & Co.
Telephone apparatus.—Siemens Bros. & Co., Ltd.
Submarine cable.—Telegraph Construction & Maintenance Co., Ltd.
Telegraph and telephone cable.—Enfield Cable Works, Ltd.; General Electric Co., Ltd.; Hackbridge Cable Co., Ltd.; Pirelli-General Cable Works, Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.; W. T. Glover & Co., Ltd.
Dry cells.—Fuller's United Electric Works, Ltd.
Porous Leclanché cells.—General Electric Co., Ltd.; Siemens Bros. & Co., Ltd.
Earth clips.—British L.M. Ericsson Manufacturing Co., Ltd.
Repeating coils.—Western Electric Co., Ltd.
Heat coils.—British L.M. Ericsson Manufacturing Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
M.C. condensers.—British Insulated & Helsby Cables, Ltd.; Fuller's United Electric Works, Ltd.; Western Electric Co., Ltd.
Switchboard cords.—British Insulated & Helsby Cables, Ltd.
Automatic dials.—Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Ducts.—Albion Clay Co., Ltd.; Candy & Co., Ltd.; Donington Sanitary Pipe and Fire Brick Co., Ltd.; Ensor & Co., Ltd.; G. Jennings; H. R. Mansfield, Ltd.; J. Woodward, Ltd.
Dynamotors.—Automatic Telephone Manufacturing Co., Ltd.
Fuses.—British L.M. Ericsson Manufacturing Co., Ltd.
Generators.—Siemens Bros. & Co., Ltd.
Insulators.—T. De la Rue & Co., Ltd.; Doulton & Co., Ltd.; Electric and Ordnance Accessories Co., Ltd.; Macintyre & Co., Ltd.
Jacks.—Siemens Bros. & Co., Ltd.
Switchboard jacks.—British L.M. Ericsson Manufacturing Co., Ltd.
Pole lifters.—W. Rogers & Sons.
Cable distribution plugs.—Siemens Bros. & Co., Ltd.
Protectors and heat coils.—British L.M. Ericsson Manufacturing Co., Ltd.
Relays.—Western Electric Co., Ltd.
Insulated tails.—London Electric Firm, Ltd.
Telephones.—British L.M. Ericsson Manufacturing Co., Ltd.
H.d. copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; Electro Metals Co.; Elliott's Metal Co., Ltd.; Enfield Cable Works, Ltd.; R. Johnson & Nephew, Ltd.; Pirelli-General Cable Works, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., Ltd.; Wilkes, Sons & Mappiebeck, Ltd.
V.I.r. wire.—W. Geipel & Co., Ltd.
Manufacture, supply, drawing-in and jointing cable.—Wembley-Gerrard Junction, Gerrard-Sloane Junction and Paddington-Langham-Museum: W. T. Henley's Telegraph Works Co., Ltd. Sheffield-Chesterfield: Callender's Cable & Construction Co., Ltd. Central-East, East-Maryland and Maryland-Ilford Junction: Siemens Bros. & Co., Ltd. Wolverhampton-Shrewsbury, Luton-Dunstable: Western Electric Co., Ltd.
Telephone exchange equipment.—Wembley-Ealing: Western Electric Co., Ltd.; Messrs. Burndept, Ltd., Blackheath, and Messrs. Isobel. Regent Street: Relay Automatic Telephone Co., Ltd.; Messrs. J. & J. Charlesworth, Ltd. Wakefield: Automatic Telephone Manufacturing Co., Ltd. Brighton (Central): Siemens Bros. & Co., Ltd.; sub-contractors for batteries, Hart Accumulator Co., Ltd.; for charging machine, English Electric Co., Ltd.; for ringing machine, Crompton & Co., Ltd.
Telephone repeater station equipment.—Gloucester, Newport (Mon), Birmingham: General Electric Co., Ltd. Aldeburgh: Western Electric Co., Ltd.

H.M. OFFICE OF WORKS.
Engineering services.—Wiring East Wing, Somerset House: R. Langston-Jones & Co. Lift work, Science Museum, South Kensington: Marryat and Scott, Ltd.

CROWN AGENTS FOR THE COLONIES.
Telegraph and telephone line materials.—Bullers, Ltd.
Telephone switchboards, &c.—British L.M. Ericsson Manufacturing Co., Ltd.
H.d. copper wire, &c.—F. Smith & Co., Ltd.

Ipswich.—Corporation.
Boiler plant for the power station.—Clayton & Shuttleworth, Ltd.

Keighley.—The Town Council last week accepted the tenders for electricity plant, mentioned in our issue of the 22nd inst. on page 298. Ald. A. Smith, chairman of the Electricity Committee, in recommending the acceptance of the English tender in preference to a Swiss tender, which was £5,200 lower, said the Committee felt that, despite the big difference in price, they were getting the best value for money. With regard to weight, steam consumption, and other matters, the English machine was the best that could be obtained. There was really no comparison between the English and foreign make.

London.—LONDON COUNTY COUNCIL.—Highways Committee. The Committee reports that, in connection with the provision of work for the unemployed, it has been in communication with the Special Committee on Unemployment, and has ascertained that the Unemployment Grants Committee has approved, for the purposes of grant, the equipment of 200 additional tramcars with high-powered motors. The grant in question will be 50 per cent. of the interest for 15 years on an amount not exceeding the cost of equipping the first 200 cars with high-powered motors. A condition of the grant is that the work must be actively commenced by March 15th, 1924, and completed within nine months from the date of commencement. The Highways Committee has been in communication with the English Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd., each of these companies being at present under contract for the supply of 100 high-powered motors for 100 class E1. Both companies are prepared to undertake the supply of 100 additional sets at the same prices as their existing contracts, *viz.*, £800 a car set + £20 a car to cover the cost of extras. The total contract in each case is £82,000, and the total cost of the work, including £2,500 incidental expenses, £166,500. The Committee recommends the Council's approval of the expenditure.

HACKNEY.—Electricity Committee. Recommended:—
Conversion of No. 3 existing d.c. set to a motor-driven unit:—
One 1,000-kVA synchronous motor and exciter (£1,200).—Bruce Peebles and Co,. Ltd.
One class C1 unit similar to existing compound-filled ironclad switchgear for No. 4, complete with exciter, control pillar, and instruments, &c. (£335).—Reyrolle & Co., Ltd.

WEMBLEY.—British Empire Exhibition. Accepted:—
Siemens' gas-filled projector-type lamps.—Siemens & English Electric Lamp Co., Ltd.

SOUTHERN RAILWAY. Accepted:—
Incandescent electric lamps for six months.—Siemens & English Electric Lamp Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.

BATTERSEA.—The Electricity Committee has recommended that the following contracts be renewed for 12 months:—
Cables.—Callender's Cable & Construction Co., Ltd.
Electricity meters.—Chamberlain & Hookham Ltd.; Ferranti, Ltd.
Electrolytic meters.—Reason Manufacturing Co., Ltd.

Southend-on-Sea.—Town Council. Accepted:—
Two sets of 12 pistons for the Diesel plant at the Electricity Works (£1,176).—Thompson, Watts & Co.

Taunton.—Town Council.—Accepted:—
Two new boilers and accessories for the Electricity Works (£3,514).—Babcock & Wilcox, Ltd.

Tiverton.—Town Council. Accepted:—
Power house (£1,684).—J. Grater & Sons.
Overhead crane (£144).—Stenner & Gunn.

Forthcoming Events.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, March 3rd. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on the "Selection and Location of Converting Plant for Supplying d.c. Networks," to be opened by Mr. R. D. Spurr.

Thursday, March 6th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "Transmission Maintenance of Telephone Systems," by Mr. P. E. Erikson, preceded at 5.30 p.m. by an exhibition by Mr. W. B. Sayers of magnetic apparatus.

(Wireless Section).—Wednesday, March 5th. At the Institution, Victoria Embankment, W.C. At 6 p.m. Paper on "Development of the Bellini-Tosi System of Direction-finding in the British Mercantile Marine," by Commander J. A. Slee, R.N. (ret.).

(Dundee Sub-Centre).—Friday, March 7th. At the University College, Dundee. At 7.30 p.m. Paper on "Points in the Design of Induction Motors with reference to Standardisation," by Mr. J. Conway.

(Western Centre).—Monday, March 3rd. At Swansea. Ordinary meeting.

(Mersey and North Wales (Liverpool) Centre).—Friday, March 7th. At the University Club, Liverpool. At 7 p.m. Annual dinner.

Royal Society of Arts.—Monday, March 3rd. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture: "A Study of the Destructive Distillation of Coal," by Mr. E. E. Evans.

Society of Engineers.—Monday, March 3rd. At Burlington House, W. At 5.30 p.m. Paper on "Development of Methods for the Collection and Disposal of House Refuse," by Mr. J. Jackson.

Roentgen Society.—Tuesday, March 4th. At the Institution of Electrical Engineers, Victoria Embankment. At 8.15 p.m. Ordinary scientific meeting.

Institution of Engineering Inspection.—Wednesday, March 5th. At the Hotel Cecil, Strand, W.C. At 7 p.m. Annual dinner.

Liverpool Engineering Society.—Wednesday, March 5th. At 9, The Temple, Dale Street, Liverpool. At 8 p.m. Paper on "Pulverised Coal," by Mr. G. P. Dennis.

Edinburgh Electrical Society.—Friday, March 7th. At the Philosophical Institute, 4, Queen Street. At 8 p.m. Paper on "Faradism," by Mr. M. McLaren.

Junior Institution of Engineers.—Friday, March 7th. At 39, Victoria Street, S.W. At 7.30 p.m. Lecturette, "An Introduction to the Study of Fire Danger in Factories, with Some Notes on Fire Insurance," by Mr. P. M. Fraser.

Ideal Homes Exhibition.—February 28th to March 22nd. At Olympia, W.

Notes.

The Metric System in Russia.—The use of the metric system was made compulsory in a number of trades, including the trade in electrotechnical goods, on January 1st, 1924. —*Board of Trade Journal.*

The Montefiore Competition.—The triennial Montefiore international prize competition for a paper on the progress made in the technical applications of electricity will be held in 1925, having been postponed from 1923. The premium is 25,000 fr. and the papers may be written in English or French. The last date for sending in papers is April 30th, 1925, addressed to M. le Secrétaire-archiviste, Fondation George Montefiore, Hôtel de l'Association, 31, Rue Saint Gilles, Liége, Belgium.

Electric Shock.—Quoting a report from Switzerland, dated January 18th, that Prof. Jenneck, Director of the Electro-pathological Institute of the University of Berne, in a conference between numerous scientists and students, had affirmed and maintained that "electric shock was not fatal," supporting his statement by the citation of cases of persons recovering after a time, after doctors had declared them to be dead—a correspondent of *Elettrotecnica* remarks: "that electric shock may not be instantaneously fatal is corroborated by the application of artificial respiration within a useful period; but is the affirmation of Prof. Jenneck exact absolutely or only relatively? Are the sufferers smitten temporarily, or permanently? When, under what circumstances, and within what limits do the phenomena of catalepsy work, and are they potent after mortification sets in? This subject is in Italy of more than individual importance and requires that the Professor shall set out the nature of his tests and detailed results; or, alternatively, that the whole subject should be remitted to a committee of experts to be investigated."

Appointments Vacant.—Storekeeper (66s.) for the Gellygaer Urban District Council Electricity Department. Plumber-Jointer for the Southend-on-Sea Electricity Department. Plumber-Jointer for the Hampstead Corporation Electricity Department. Electrical engineer for the Eston Urban District Council. Plumber-Jointers for the Preston Corporation Electricity Department. Shift charge engineer for Leigh Borough Council Electricity Department. Three sub-station inspectors and six sub-station operators for the Manchester Corporation Electricity Department. Plumber-Jointer for the Newport (Mon.) Corporation Electricity Department. Engineering assistant, mains department (£520) for the Newcastle and District Electric Lighting Co., Ltd. (See our advertisement pages to-day.)

The Electrical Engineers' Ball.—In January, 1904, we announced (with considerable misgivings) that a number of eminent electrical engineers proposed to hold a dance at the Hotel Cecil. In February we were able to say that it had been a complete success, and that "there is little doubt that the Electrical Engineers' Ball has come to stay as a hardy annual." We prophesied better than we knew, for at last Friday's function, also at the Hotel Cecil, some 580 tickets were presented, and even then there were a number of absentees. Mr. Llewellyn Atkinson was, unfortunately, ill, and Mr. M. J. Railing was unavoidably detained. Of the dance itself little need be said beyond that it went from beginning to end with that smoothness and precision which is only attained by first-class "staff-work." Malcolm Ives's orchestra provided an excellent programme, and Mr. Knightsmith, the well-known toast master, "kept the ring" as he has done for so many years past. Just twenty years have elapsed since the first dance was held, and it is not without interest to note that nine members of the original General Committee were still serving this year. Mr. A. M. Sillar is deserving of special mention; he was one of the hon. secretaries then, and he occupies the same position, with its heavy responsibilities, to-day. It is impossible to praise too highly the unselfish and exacting work carried on for many months by the Executive Committee, whose only reward is the feeling of satisfaction which proceeds from the knowledge that a good job has been well done. We do not therefore apologise for giving their names again. Executive Committee: Messrs. O. H. Baldwin, J. E. Kingsbury, W. S. Lonsdale, P. V. McMahon, A. M. Sillar, O. H. Wordingham, C.B.E., R. J. Wallis-Jones, A. H. Walton. Hon. Secretaries: Messrs. A. M. Sillar, W. S. Lonsdale. Hon. Treasurer: Mr. J. E. Kingsbury.

The Co-operation of Staff Associations.—A joint meeting of the Society of Technical Engineers (North-Western District) and the British Association of Chemists (Manchester Branch) was held at the Grand Hotel, Manchester, on February 20th. The meeting opened with an address by Mr. L. H. A. Carr, Chairman of the Executive Council of the S.T.E., on the possibilities of co-operation between the various technical staff associations. Mr. E. F. Morris, chairman of the Council of the B.A.C., followed with a short speech on the subject, while the matter was also discussed by Dr. Hankey (B.A.C.), Mr. N. S. Hubbard (S.T.E.), and Mr. Kaye (B.A.C.). It was agreed by all the speakers that such co-operation was most eminently desirable. An enjoyable smoking concert followed the formal part of the business.

French Manufacturer's Gift.—M. Jules Richard, a well-known French manufacturer of instruments of precision, has just contributed the handsome gift of a 300,000-fr. annuity towards the foundation of a school of mechanics for apprentices. The aim of the school is to instruct the youthful apprentice in all the details of the making of instruments of precision in order to make the finished mechanician, as opposed to the method of Taylorism and the making of instruments in series, which tends to reduce the worker to the *rôle* of a machine or a maker of parts only. The future of the French industry calls, M. Richard thinks, for a reaction against this tendency.

The Gas Light and Coke Company's Sliding Scale.—From a letter signed by Mr. Wm. L. Galbraith, Secretary to the Gas Light and Coke Company, in the *Gas World* of February 23rd, we abstract the following sliding scale in connection with the dividends on the company's ordinary stock, as revised in accordance with the Gas Light and Coke Company (Charges) Amending Order, 1923, made by the Board of Trade on December 22nd, 1923.

The dividends shown in this table are the maximum dividends which the company is entitled to pay on the ordinary stock with the standard price of 11d. per therm, it being entirely at the discretion of the directors to declare a lower dividend if it is considered advisable to do so.

	Ordinary Stock.			
		Redemption Fund (See Footnote.)		
Price of Gas per Therm.	Maximum Rate of Dividend. Per cent.	Annual Amount.	Approximate Rate Per cent.	Net Rate of Distributable Dividend. Per cent.
d.	£ s. d.	£	£	£ s. d.
12·0	3 6 8	Nil	Nil	3 6 8
*11·0	*4 0 0	Nil	Nil	*4 0 0
10·0	4 13 4	20,000	2 8	4 10 8
9·0	5 6 8	40,000	5 4	5 1 4
8·0	6 0 0	40,000	5 4	5 14 8
7·0	6 13 4	40,000	5 4	6 8 0
6·0	7 6 8	40,000	5 4	7 1 4

* Standard Price and Dividend.

NOTE.—After £1,000,000 of ordinary stock has been purchased, by means of the Redemption Fund, and cancelled, the deduction for the Redemption Fund ceases.

The original table gives intermediate values in steps of 0.2d. per therm.

Electrical Power Engineers' Association.—Under the auspices of the above Association, the following three lectures will be given in various parts of the country:—

Friday, March 7th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. On "Localisation of Faults on Mains," by Mr. J. Urmston.

Tuesday, March 25th. At the Chamber of Commerce, Birmingham. At 7.30 p.m. On "Combustion and Boiler-house Efficiency," by Mr. J. N. Waite.

Friday, April 4th. At the Institution of Electrical Engineers, Victoria Embankment, W.C. At 7 p.m. On "The Parallel Operation of A.C. Power Stations," by Mr. C. Howarth.

Wages in the Engineering Trade.—According to the *Financier* a national movement to secure an increase of wages of the operative engineer in industry is suggested. A Sheffield committee of the Amalgamated Engineering Union has at the instigation of branches framed a recommendation that steps should be taken to secure an increase of wages to meet the difference between the purchasing power of the £ to-day compared with 1914. It is suggested that the national executive should take the matter up with the Engineering Trades Employers' Federation. It is computed that the demand resolves itself into one of an increase of 15s. 6d. per week. The Sheffield members consider that their present wages, £2 19s. 6d. per week, are inadequate, and they point out that reductions have taken place in the last three years, totalling £1 6s. 6d. per week. The recommendation applies to 5,000 members of the union in Sheffield.

Automatic Telephony.—At a meeting of the Birmingham and District Electric Club on February 22nd, a lecture was given on "Automatic Telephony" by Mr. H. E. Humphries, of Messrs. Siemens Brothers & Co., Ltd., Woolwich. The lecture was illustrated by lantern slides and explained by means of a working model automatic telephone equipment by which a demonstration was given of the electrical and mechanical operations involved in the selection of any one line in 10,000 telephone lines. At the close of the lecture there was a very interesting and full discussion and some interesting particulars were given by Mr. T. Plummer, Superintending Engineer, G.P.O., Shrewsbury, who stated that plans were now in hand to install a complete automatic telephone system in Birmingham and it was expected that the first exchanges, the Central and Midland, would be working in three years' time and it was estimated that shortly afterwards there would be 42,000 automatic telephones in Birmingham and 75,000 stations by the year 1930. There were now about 1 per cent. of lines to population in Birmingham, whereas the average for the United States of America was 10 per cent. of lines to population.

A New "Daylight" Lamp.—Demonstrations were given recently at the showrooms of the Glasgow Corporation Electricity Department in Sauchiehall Street of the new "Lamplough Daylamp" which by means of a double glass filter corrects electric light and produces an illumination closely resembling daylight, enabling the choice of colours to be made with certainty at all times. The filter is the invention of Mr. F. E. Lamplough, Lecturer in Science, University of Cambridge.

The Reduction of Current Losses in Transformer Pillars.—La Société Française des Electriciens, in conjunction with the Syndicat des Producteurs et Distributeurs d'Energie Electrique, is organising a series of tests of apparatus and methods for reducing current losses in transformer pillars when out of operation. The object in mind is particularly that of distributing systems in rural areas where transformer pillars are used in a somewhat irregular manner which entails considerable losses. The organisers hope that as a result of the trials it will be possible to install in such pillars apparatus which will automatically put the transformers in and out of circuit in accordance with the varying demand for electricity, or some arrangement which will reduce the existing losses. Manufacturers of apparatus designed for this purpose are invited to take part in the trials which are to be held in July next. Entries, however, must be sent to La Société Française des Electriciens, 14, Rue de Stael, Paris—from which further particulars can be obtained—before April 15th next.

Institution Notes.

Institution of Electrical Engineers.—INFORMAL SECTION.—A discussion on the work of the International Conference on e.h.p. lines, held in Paris in November, 1923, will be opened by Monsieur J. Tribot Laspierre, at an extra meeting, at 7 p.m. on March 10th, 1924. In view of the great importance of this subject, it is hoped that there will be a large attendance of electrical engineers from all parts of the country.

At the meeting of the Informal Section, on February 18th, Mr. F. Gill was in the chair when Mr. E. M. Malek opened a discussion on "Electrical Developments in France." Articles on French development in the technical Press had given no definite idea of the courageous and far-sighted schemes in progress or projected. In France co-operation and interlinking were not unknown, and the examples set by the companies in the Lyons area showed what could be done. Few people were aware of what existed, and those who knew probably found out through becoming interested in the 100,000-volt d.c. system on which Mr. J. S. Highfield read a paper some 13 years ago. M. le Trocquer, Minister of Public Works, recently stated that France had 9,000,000 h.p. available from water power. In 1919 1,500,000 h.p. was in use; by 1925 there would be 3,000,000. The Public Works Department was dealing with 200 applications for sites, totalling 1,500,000 h.p., so that in 10 years there should be 4,000,000 h.p. developed, representing a saving of 24,000,000 tons of coal per annum. There were 82 power houses in France, having a capacity of over 10,000 kW; of these 10 were over 50,000, two of them over 100,000 and Gennevilliers had 200,000, and would have 400,000 kW. Those stations would be inter-connected and form part of a general distributing system into which all new stations would also feed their surplus energy. The regions of hydraulic power were the east, centre, and south. In those areas and between them a complete network of overhead lines was projected and being built on a pre-determined plan. Apart from the inter-connection of those three areas, Paris would be connected to each, whilst the eastern area would also be connected with the north-east industrial area, which in turn would be connected to the towns on the north coast, Amiens, and Rouen. Lines from the south-west and centre would feed the west coast, and be continued into Brittany and Normandy, linking with Rouen and Caen; thus forming a ring main round France.

Some of the hydro-electric stations in hand or projected were:—Gennissiat, 240,000 h.p.; Eilloux, 20,000 h.p.; Bourain, 55,000 h.p.; Charraz (two stations at Brens and Peyrieux) of 1,000 and 25,000 h.p. respectively; Tremur, 31,000 h.p.; Sault, 43,000 h.p.; Ternay, 45,000 h.p.; Condrieu, 50,000 h.p.; Audance, 52,000 h.p.; Glun, 80,000 h.p.; Valence, 165,000 h.p.; Baix, 96,000 h.p.; Montelimar, 174,000 h.p.; Montdragon, 240,000 h.p.; Avignon, 127,000 h.p.

The Union Hydro-Electrique had been formed to build a 50,000-kW station at Eguzon sur la Creuse. At Chambon a plant of 150,000 h.p. would be installed, and the Union Hydro-Electrique, with the Associated P.O. Railway, would have between them 244,000 h.p. at work within the next two years.

In the Alpes Maritimes there were four schemes in hand:—Isere, 180,000 h.p.; Durance, 185,000 h.p.; Arc, 118,000 h.p.; Romanche, 75,000 h.p. Mr. Malek believed that a considerable redistribution of the population was likely with very great growth in the metallurgical industry, and with consequent enormous reaction upon the rest of Europe. Messrs. G. L. Addenbrooke, A. W. Berry, J. Coxon, F. Gill, A. V. Hook, A. G. Hilling, R. A. MacMahon, W. J. Minton, S. W. Melsom, A. R. Rendall, Major T. Rich, W. E. Rogers, and A. C. Sparks spoke on the discussion.

INFORMAL MEETINGS CONCERT.—The section held its fifth annual smoking concert at the Engineers' Club, W., on February 25th. Col. T. F. Purves, O.B.E., took the chair and proved a useful "extra turn" during an interlude caused by the lateness of some of the artistes, telling two or three very good stories. Mr. Arthur Raven was at the piano, and the programme was provided by Messrs. Cecil Liddard, Bret Hayden, Syd May, Courtney Mayverne, and the Misses Dorrie Dene and Marie Manning. The two amateur "turns," Mr. J. Corthesy, who recited "Tomlinson" (Kipling), "The Execution" (*Ingoldsby Legends*), and other monologues, and Major C. H. Montgomery, who gave a sleight of hand performance, were a great success.

IRISH CENTRE.—At a meeting of the Irish Centre of the Institution at Dublin, on Thursday last week, Mr. R. N. Tweedy, chairman of the Irish Centre, presided. Mr. A. G. Bruty read a paper on "Electrical Equipment for Printing Presses," explaining the working of the various machines requiring power, and gave demonstrations showing how the value of machines could be increased by the use of electricity.

MERSEY AND NORTH WALES (LIVERPOOL) CENTRE.—Prof. E. W. Marchant, D.Sc., delivered a popular lecture on "Radio Reception" in the Arts Theatre of the University, at Liverpool, on February 18th, to an audience of 700. The lecture was illustrated with lantern slides and two films, one showing the assembly and manufacture of the ordinary telephone, and the other illustrating the theory and working of the three-electrode valve; both were very much appreciated by the audience. Dr. Marchant also exhibited the dynamic model of a valve and oscillating circuit, the details of which had been suggested by Mr. R. C. Clinker in a recent paper published by the Institution. Demonstrations in radio reception were given at the close of the lecture. Mr. E. M. Hollingsworth presided, and reminded the audience that over 1,300 applications had been received for tickets of admission to this lecture.

Physical Society of London.—ANNUAL MEETING.—On February 8th the reports of the Council and Treasurer were adopted, and the following officers were elected for 1924:—

President: F. E. Smith, C.B.E., F.R.S.

Elected Vice-Presidents: E. H. Rayner, M.A., Sc.D.; J. H. Vincent, D.Sc., M.A.; T. Smith, B.A.; C. R. Darling, F.I.C.

Hon. Secretaries: D. Owen, B.A., D.Sc.; Prof. A. O. Rankine, O.B.E., D.Sc.

Hon. Foreign Secretary: Sir Arthur Schuster, Ph.D., Sc.D., F.R.S.

Hon. Treasurer: W. R. Cooper, M.A., B.Sc.

Other Members of Council: R. W. Paul; Prof. C. L. Fortescue, O.B.E.; W. S. Tucker, D.Sc.; Prof. S. W. J. Smith, M.A., D.Sc., F.R.S.; J. S. G. Thomas, D.Sc.; J. Guild, A.R.C.Sc., D.I.C.; F. L. Hopwood, D.Sc.; E. A. Owen, B.A., D.Sc.; J. Robinson, M.Sc., Ph.D.; G. B. Bryan, D.Sc. Prof. Max Planck was elected an Honorary Fellow of the Society, and on behalf of the Council Dr. Alexander Russell awarded the first Duddell Memorial Medal to Prof. H. L. Callendar, C.B.E., M.A., LL.D., F.R.S.

JUBILEE CELEBRATIONS.—The following programme has been arranged: On March 20th, after a reception at 3 p.m., the Guthrie Lecture will be delivered by M. le Duc de Broglie.

and then, following an interval, Sir R. Paget will lecture at 6 p.m. On March 21st there will be reminiscences by Fellows, and on March 22nd the banquet will be held.

Institution of Civil Engineers.—FORTHCOMING PAPERS.—Amongst the papers to be read shortly are two of special interest to electrical engineers, namely, one by Messrs. H. N. Allott, M.Inst.C.E., and S. L. Pearce, C.B.E., M.Inst.C.E., on the Barton power station of Manchester Corporation and the transmission system in connection therewith, and one by Mr. W. Burnside, A.M.Inst.C.E., on the Dalmarnock Electricity Works of Glasgow Corporation. It is understood that there will be a joint discussion on these papers.

Roentgen Society.—The seventh Silvanus Thompson Memorial Lecture will be delivered by Prof. C. G. Barkla, F.R.S., of Edinburgh University, at the Institution of Electrical Engineers, on Tuesday, April 1st, 1924.

Institution of Mechanical Engineers.—ANNUAL REPORT.—The Council's report on the progress of the Institution for 1923 shows that at the end of that year the total membership was 9,227, representing a net increase of 493. The various research committees record progress; 15 papers were read and discussed, and 14 others were published. Eight informal meetings took place, the average attendance being 56. The scheme for the award, in conjunction with the Board of Education, of national certificates and diplomas in mechanical engineering has been carried on. Examinations were held at 77 technical schools and colleges at the termination of approved courses, attended by 1,427 candidates, as a result of which there were awarded 606 ordinary and 122 higher certificates; 38 ordinary and 30 higher diplomas. The scheme now includes 87 schools. A similar scheme has been arranged in conjunction with the Scottish Education Department. The Council has accepted the higher national certificate, and the higher national diploma as exempting, subject for subject, from the associate membership examination.

The accounts show that the total expenditure amounted to £30,149, the balance being £1,037. The Institution has five branches and three graduates' sections.

Radio Society of Great Britain.—The Radio Society and the Radio Transmitters' Society have amalgamated. We are asked by letter to announce that the calibration waves recently sent from 6 XX were sent as arranged every night except one. The signals of diminishing strength which it was proposed to transmit were, however, not transmitted. It was found difficult to alter the strength of the signals in the manner desired with the apparatus at present installed at 6 XX.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Ealing Town Council, on the recommendation of the Electricity Committee, has granted the Borough Electrical Engineer, Mr. J. DOUGLAS KNIGHT, an honorarium of £500, and the thanks of the Council were accorded to him for the services he had rendered in carrying out the negotiations and preparing the details, reports, and statistics for a bulk supply, and also for the large amount of work performed by him in connection with the installation of the new generating plant and machinery.

MR. J. GRIFFITHS, electrician at Bentley Colliery and consultant electrician to the Bentley Urban Council, who will leave for India shortly, has been presented with a silver cigarette-case by the Council officials.

MR. S. PEARSON, superintendent of the Thornbury tramway works of the Bradford Corporation, who has been associated with the Bradford tramways for twenty-two years, is leaving the city to enter business on his own account elsewhere. On February 21st, at a social gathering, the staff presented him with a wallet of Treasury notes.

MR. DAVID JONES, who has been in the service of the Yorkshire Electric Power Co. for 16 years, and latterly as engineer for the central district, is leaving the company to join his father in business at Holyhead. Last week the operation department staff presented him with a clock.

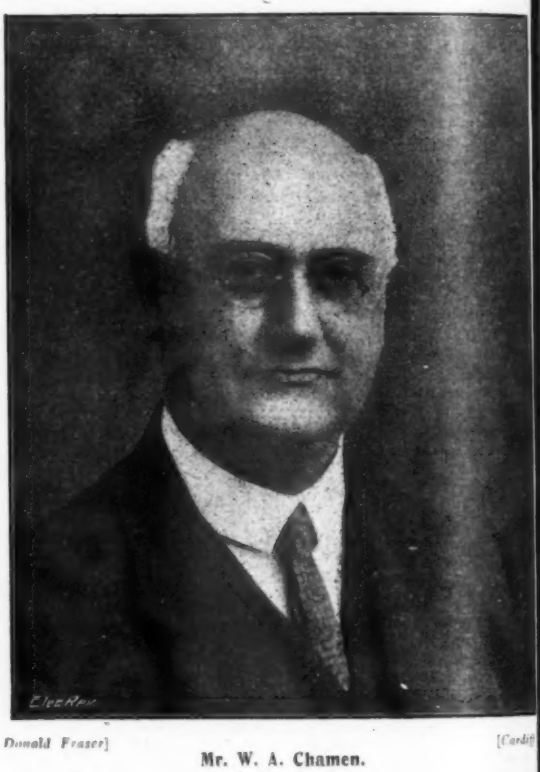
Londonderry Corporation Lighting Committee has elected Alderman THOMPSON chairman of the Committee for the ensuing year.

MR. H. PAYN, engineer and manager of the Northwood Electric Light & Power Co., Ltd., has been appointed engineer and manager of the Boston & District Electric Supply Co., Ltd.

The *Commonwealth Engineer* for January states that Mr. W. A. COATES, chief switchgear engineer of the Metropolitan-Vickers Electrical Export Co., Ltd., London, has been visiting Australia in connection with the company's affairs. Early in January he was to address members of the Sydney division of the Institution of Engineers, Australia, on "Some Notes on the Application and Design of Large Switching Apparatus."

A *Reuter* dispatch states that MME. CURIE has been granted the freedom of the City of Warsaw.

MR. WILLIAM ASHCOMBE CHAMEN, engineer and general manager of the South Wales Electrical Power Distribution Co., was last month elected president of the South Wales Institute of Engineers, and he delivered a striking address before that Institute on January 24th, taking, as he described it, an unusual subject for an engineering institution—the blending of all classes in united effort for the common weal. Christianity, if adopted by the majority, being the only sovereign remedy for the prevailing industrial situation, enabling the nation to pull itself together and recover its former commercial position. Mr. Chamen has been a member of the District Joint Industrial Council and of the National Joint Industrial Council (Electricity Supply) for the past three years, and in his address he said he had become a much wiser and sadder man in consequence, but he would try to draw as much wisdom as possible and leave the sadness out. Mr. Chamen, whose photograph we are enabled to publish, was born in 1864, at New Cross, and he was educated at Forest School, Walthamstow. After serving for two years with Messrs. James Gibb & Co., at Plymouth, he met Col. R. E. Crompton, and became associated in 1879 with the business of Crompton & Co., remaining with them for 17 years. In the year 1896 he was appointed corporation elec-



Donald Fraser] [*Cardiff*

Mr. W. A. Chamen.

trical engineer to the city of Glasgow, and remained there until 1905. In that period he constructed the Port Dundas and St. Andrew's Cross generating stations. On leaving Glasgow he joined the firm of Messrs. Bramwell and Harris, consulting engineers, Westminster, who were at that time engaged in the laying out of the equipment of several electrical power undertakings, including that of the South Wales Electrical Power Distribution Company, to the management of which he was appointed. The company had an uphill task, but the progress made under Mr. Chamen's guidance may be gathered from the fact that, while in 1905 the total output which the company sold, including that from the Neath and Bridgend stations, which were afterwards acquired by the respective local authorities, was 3,154,396 kWh, last year the units sold amounted to 59,225,567 kWh. The company has recently started up a 15,000-kW Parsons turbo-alternator. One of Mr. Chamen's sons was killed in the war, in 1916.

Obituary.—MR. H. DAY.—News was received at Bradford last week of the death, from gunshot wounds in China, of Mr. Harold Day, who four years ago took up an appointment with the Hong-Kong Electric Co. He was formerly in the Bradford Corporation Electricity Department.

HERR L. SCHROEDER.—The death is announced from Hagen, Westphalia, of Herr Ludwig Schroeder, one of the technical directors of the Accumulatoren Fabrik Gesellschaft. The deceased, who was 70 years of age, was responsible for many improvements in secondary battery production.

MR. W. J. KEMPTON.—We regret to learn of the death, following an operation on the 24th inst., of Mr. W. J. Kempton for many years manager of the Glass Works of the Edison Swan Electric Co., Ltd., Ponders End.

MR. J. BAINBRIDGE.—Mr. James Bainbridge, of West Hartlepool, passed away recently at the age of 66 years. The

deceased entered the service of the Magneto Telegraph Co. as a boy. He retired before the war from the position of supervisor of the telegraph department at West Hartlepool Post Office, but resumed duty during the war.

Will.—The late Mr. FREDERICK L. RAWSON left estate in the United Kingdom of the gross value of £1,230, with net personalty nil.

New Companies Registered.

Rossanglia Engineers, Ltd. (195,774).—Private company. Registered February 15th. Capital, £1,000 in £1 shares. To act as representatives and/or agents for British and other firms in the engineering and allied trades in connection with trade in the Russian and Siberian and other markets, &c. The first directors are:—J. W. Firth, Woodside, Hipperholme, near Halifax, engineer; P. Firth, Glenwood, Bradford Road, Brighouse, engineer; T. Rigg, Cranbourne, St. Andrew's Avenue, Morley, engineer. Qualification, £100 shares. Remuneration as fixed by the company. Secretary: F. L. Kilby. Registered office: Bradford Road, Bailiff Bridge, Yorks.

Vactric, Ltd. (195,852).—Private company. Registered February 19th. Capital, £1,000 in 202 "A" shares of 10s. each and 899 "B" shares of £1 each. To carry on the business of importers, sellers and manufacturers of and dealers in electrical goods of all kinds and vacuum and/or suction cleaners, &c. The subscribers (each with one "B" share) are:—G. E. Hancock, 193, Langham Road, West Green, N.15, solicitor's cashier; Dr. Eugene C. Weiss, 17, Hampden Road, Hornsey, N., solicitor's assistant. The first directors are not named: Solicitors: Buckeridge and Evans, 3-4, Clement's Inn, Strand, W.C.2.

Rees, Mace Manufacturing Co., Ltd. (195,839).—Private company. Registered February 19th. Capital, £1,000 in £1 shares. To carry on the business of engineers, electricians, founders, smiths, machinists, manufacturers of and dealers in all kinds of wireless apparatus, telegraphic and telephonic apparatus, &c. The first directors are:—L. B. Pell, Guards Club, Brook Street, W.1; M. R. Cahill, 66b, Princes Square, Bayswater, W. Remuneration as fixed by the company. Secretary: E. Griffiths. Registered office: 53, Pall Mall, S.W.1.

Victoria Wireless Co., Ltd. (195,814).—Private company. Registered February 18th. Capital, £900 in 575 10 per cent. cumulative preference shares of £1 each and 500 ordinary shares of 1s. each. To carry on business as indicated by the title. The first directors are:—F. Whatton, 113, Sherman Road, S.W.9, civil engineer; G. Defries, 6, Handel Mansions, Brunswick Square, W.C.1.

Weston Electric Lighting Co., Ltd. (195,731).—Private company. Registered February 14th. Capital, £1,000 in £1 shares. To carry on the business of electrical and mechanical engineers, &c. The first directors are:—J. Armstrong, 197, Derby Street, Bolton, spinning master; W. Collier, 17, Duke Street, Bolton, electrical engineer; J. Barlow, 234, Weston Street, Bolton, electrical engineer (managing director). Qualification, £200. Registered office: 143a, Fletcher Street, Bolton.

Euston Ignition Co., Ltd. (195,697).—Private company. Registered February 13th. Capital, £5,000 in £1 shares. To take over the business of a motor accessories dealer carried on by F. G. Kirby, at 329, Euston Road, N.W., as the "Euston Ignition Co." The subscribers (each with one share) are:—F. G. Kirby, 329, Euston Road, N.W., electrical engineer; Mrs. L. A. Kirby, 329, Euston Road, N.W.; A. Whittingham-Jones, 53, Victoria Street, S.W., associated accountant. F. G. Kirby is permanent managing director and chairman. Registered office: 53, Victoria Street, Westminster, S.W.

G.W., Ltd. (195,698).—Private company. Registered February 13th. Capital, £5,000 in £1 shares. To acquire an invention, viz., a combined plug and switch electrical safety box, and to take over suitable works for developing the same, &c. The subscribers (each with one share) are:—S. E. Grubb, 53, Mayfield Avenue, Southgate, electrical engineer; D. Wallis, 6, Solna Road, Winchmore Hill, N.21, engineer. The first directors are to be appointed by the subscribers. Solicitors: W. Scott, 9 and 10, George Yard, Lombard Street, E.C.

English Radio Corporation, Ltd. (195,755).—Private company. Registered February 15th. Capital, £10,000 in £1 shares. To take over the business of wireless and electrical engineers carried on by S. A. Hirst, A. M. Braithwaite, and J. H. Fulford, as the British Radio Corporation at Rawdon, Yorks., and all or any of the assets and liabilities of the vendors in connection therewith. The subscribers (each with one share) are:—F. J. F. Curtis, City Chambers, Leeds, solicitor; S. C. Greenfield, City Chambers, Leeds, clerk. The first directors are to be appointed by the subscribers. Qualification, £100. Remuneration as fixed by the company. Registered office: Flaxton Works, Rawdon, near Leeds.

Cook's Wireless Co., Ltd. (195,750).—Private company. Registered February 15th. Capital, £1,000 in £1 shares. To take over the business of manufacturers of and dealers in wireless and other electrical apparatus, &c., carried on at Ipswich as "Cook's Wireless Co.," and to adopt an agreement with C. E. Dansie and T. E. Fish. The permanent governing directors are:—C. E. Dansie, 9, Bedford Street, Ipswich, traveller; T. E. Fish, 30, St. Matthew's Street, Ipswich, jeweller. Registered office: 57, St. Matthew's Street, Ipswich.

Service Radio Co., Ltd. (195,775).—Private company. Registered February 15th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers of wireless instruments, &c. The first directors are:—W. Grossman, 43, Highbury New Park, N.5, wireless engineer; Mrs. Leah Grossman, 67, Church Street, Stoke Newington, N.16. Qualification, three ordinary shares. Registered office: 67, Church Street, Stoke Newington, N.16.

English Cable Supplies, Ltd. (195,754).—Private company. Registered February 15th. Capital, £500 in £1 shares. To carry on the business of designers, manufacturers, repairers, exporters, importers and factors of, contractors for and dealers in electric wires and cables of all kinds, &c. The first directors are:—J. Pendleton, 12, Fitzgerald Road, Liverpool, butcher; Mrs. M. C. Pendleton, 12, Fitzgerald Road, Liverpool. Qualification, £20. Registered office: 12, Haskins Hey, Liverpool.

Official Returns of Electrical Companies.

Aladdin Renew Electric Lamp Corporation, Ltd.—Sir Harry Foster, J.P., 82, Victoria Street, Westminster, S.W.1, ceased to act as receiver or manager on February 13th, 1924.

Expert Electrical Co., Ltd.—A. J. Davis, of 36, King Street, Cheapside, E.C., was appointed receiver on February 4th, 1924, under powers contained in a debenture dated April 13th, 1920.

New Welding Co., Ltd.—E. D. Basden, of 73, Basinghall Street, E.C., ceased to act as receiver or manager on February 13th, 1924.

Re-Echo Electrical Manufacturing Co., Ltd.—C. F. P. Richards, of 12, Chandos Road, Tottenham, was appointed receiver on February 14th, 1924, under powers contained in mortgage debenture dated June 4th, 1923.

Specialities (Liverpool), Ltd.—Charge on the company's undertaking and property, present and future, including uncalled capital dated January 28th, 1924, to secure all moneys due or to become due not exceeding £1,000. Holders: Anti-Vibration Electric Lamp Co., Ltd., 3, Love Lane, E.C.

Neale Magnet Construction Co., Ltd.—Debenture dated February 9th, 1924, to secure £200, charged on the company's property, present and future. Holder: Lt. W. L. C. Carter, R.N., Wychwood House, Barfield, Ryde, I.W.

Jersey Electric Lighting & Power Co., Ltd. (138,351).—Nominal capital, £50,000 in 40,000 preference and 10,000 ordinary shares of £1 each. Return of allotments made up to February 24th, 1924, shows seven preference and 800 ordinary shares allotted, all payable in cash. Mortgages and charges, nil.

Credenda Conduits Co., Ltd. (126,340).—Return dated January 14th, 1924. Capital, £50,000 in £1 shares. All shares taken up. £30,000 paid. £20,000 considered as paid. Mortgages and charges, nil.

City Notes.

The "Underground" Group.

The annual meetings of the "Underground" group of companies were held on February 21st under the chairmanship of Lord Ashfield. In presenting the reports and accounts Lord Ashfield said that the increase of 15 per cent. in the traffic figures showed that the travel habit was showing renewed growth. The slight reduction in receipts appeared to be due to the transfer of season-ticket holders to the slightly-cheaper workmen's return tickets which involved only a small daily outlay. The increase in traffic was entirely due to the omnibuses; there had been a decrease of 6 per cent. in the number of railway passengers. This was not wholly accounted for by the temporary partial closing of the City and South London Railway. The expenses were reduced by only a small amount; there had been no marked reductions in the cost of either labour or materials, with the one exception of motor spirit. They had endeavoured to hold an even hand between reserves and dividends. In a prosperous year shareholders might think that the reserve provisions were too great, but this enabled them in a difficult year to maintain dividends and the financial credit of the companies. Although the reserves were insufficient to cover the theoretical depreciation, there was a wide difference between this and what was found in actual practice. Though the amounts specifically carried to reserve this year were reduced, this did not mean that the most careful consideration had not been given to the question of maintaining the property in an efficient condition. Referring to the problem of London traffic, the chairman spoke of the competition of "pirate" omnibuses which, he said, had caused dangerous and costly congestion. To prevent the railways and tramways from being prejudicially affected, the company had decided to increase the number of its omnibuses to meet this competition. Passengers were being attracted to the railways by the prospects of longer rides, and extensions reaching right into the undeveloped areas on the fringe of London. Among the improvements upon the railways was the provision of a number of escalators for facilitating movement. Eleven miles was being added to the system and 300 new cars were in course of production. The Golders Green-Hendon extension had been opened. The Camden Town junction railway and the City and South London Railway from Euston to Moorgate would be opened in April, the extension to Edgware in the summer, and the rest of the City and South London Railway in the autumn. Next year the Morden and Kennington extensions would be completed. Improvements and extensions since 1918 up to the end of the present programme would have cost over £20,000,000. In conclusion, Lord Ashfield urged the control of traffic by a fair and impartial body, capable of reaching judicial decisions, and without particular interest in any form or class of transport.

London Electric Supply Corporation, Ltd.

Mr. Ernest Benson presided at the annual meeting on February 22nd, and in moving the adoption of the report and accounts (*vide* our last issue, p. 308), said that the revenue had increased in spite of reductions in prices; the policy of cheapening electricity would continue during the current year. The cost of production had been reduced from 1.08d. to 1.05d. per kWh. The increase in the sales of energy was mainly due to the development of the area on the south side of the Thames. The chairman outlined the provisions of the London Electricity Supply (No. 2) Bill, which, he thought, would enable London to receive as cheap a supply of electricity as any city in the world.

The work in hand at Deptford would add about 80,000 h.p. to the company's plant, which would then have a maximum capacity of 150,000 h.p. The additional land which the company had would permit the present capacity to be doubled,

with ample storage room for fuel, &c. In the future it might become necessary to build large stations further down the Thames, or actually on the Kent coalfields, but the advantage of having stations at the centre of gravity of the load would always remain. In conclusion, Mr. Benson referred to the inauguration of a staff provident fund.

At the conclusion of the meeting an extra-ordinary meeting was held, at which the above-mentioned Bill was approved, and the sub-division of the £3 ordinary shares into three of £1 each was sanctioned.

Midland Counties Electric Supply Co., Ltd.

The trading profit of the company's undertakings for 1923 was £128,916, an increase of £21,186. Of this £17,565 has been transferred to reserve. After meeting expenses, and debenture and loan interest, and placing £5,407 to debenture redemption account, and £15,000 to general reserve, there is a balance of £53,718 (including £4,007 brought forward). It is proposed to pay a dividend at the rate of 5½ per cent., less tax, for the year 1923 on 750,000 ordinary shares, and for the half-year ended December 31st on 225,000 ordinary shares issued in part payment for the Spondon generating station. A balance of £4,691 is carried forward.

London United Tramways, Ltd.

The traffic receipts for the year amounted to £425,996, and the net receipts were £57,174. To this was added miscellaneous receipts amounting to £10,604, making available £67,778. This amount is divided between interest and payments to local authorities (£48,570), and reserve for reconstruction and renewals (£19,208). Under the Company's Act of 1918 no dividend can be paid on the preference or ordinary shares until £400,000 has been expended upon reconstruction. The amount so expended has reached a total of £356,533. The meeting was held on Wednesday last.

Metropolitan Railway Co.

Lord Aberconway (chairman) presided at the annual meeting on February 21st. In presenting the annual report and accounts, which were abstracted in our last issue, he stated that the capital account was overdrawn to the extent of £1,038,000, but this was covered by the borrowing powers, and an amount of £1,600,000 was left. At the conclusion of the meeting an extraordinary meeting was held, at which the directors were given the shareholders' sanction to raise the capital authorised by the Company's Act of last session.

Kensington and Knightsbridge Electric Lighting Co., Ltd.

The annual report shows that the net profit for the year 1923 was £21,460, and to this was added £12,114 brought forward, making £33,574. Interim dividends paid during the year absorbed £8,625, and it is recommended that the balance of £24,949 be allocated as follows:—Second half-year's dividend on the first preference shares, £1,500; dividend on the second preference shares for the last quarter of 1923, £625; final dividend on the ordinary shares of 7s. per share and a bonus of 2s. per share, making 14 per cent. for the year, £9,450; leaving £13,374 to be carried forward. The balance of the renewal and reserve fund now stands at £176,347, of which £115,629 is the amount expended in excess of capital received, the balance being represented by working capital, investments, and cash balances. The connections rose from 21,159 to 22,267 kW, and the amount of energy sold during the year was 8,698,049 kWh. The meeting is to be held on March 6th, and an extraordinary meeting for the purpose of approving the London Electricity Supply (No. 2) Bill will follow.

Smithfield Markets Electric Supply Co., Ltd.

The net profit for 1923, after providing for interest on debenture stock and other charges, placing £4,500 to depreciation fund and £3,000 to debenture stock redemption fund, amounted to £7,052. To this was added £1,849 brought forward, making available £8,901. The deduction of the interim dividend paid in August last left £7,101, and it was proposed to deal with this balance as follows:—Dividend at the rate of 5 per cent. (1s. per share) for the latter half-year, making 8 per cent. for the year, £3,000; transfer to reserve, £2,000; carrying forward, £2,101. The output of energy showed a satisfactory increase, and the revenue was well maintained notwithstanding reductions in the charges. A further reduction was made as from January 1st. The meeting was held on Wednesday last.

Yorkshire Electric Power Co.

The annual meeting was held in Leeds on February 19th, Mr. A. G. Lupton (chairman) presiding. In presenting the report and accounts (which were reviewed in our last issue), the chairman said that the sale of energy for the year showed an increase of 23.4 per cent. over that for 1922. Larger and more efficient generating plant had enabled them to reduce working costs considerably. With the 62 miles of mains laid during the year, the company had 568 miles in operation, and the company was in a position to deal with demands which might arise in practically any part of its area. Referring to the reorganisation of electricity supply in the West Riding of Yorkshire, Mr. Lupton said that he hoped an agreement fair to both shareholders and the municipal authorities would soon be reached. He said that developments in the matter of the distillation of coal were being carefully watched, so that the company might be ready to deal with them. The report and accounts were adopted.

Melbourne Electric Supply Co., Ltd.

The annual meeting was held in Melbourne in December. The chairman (Mr. Agar Wynne), in moving the adoption of the report and accounts for the year ended August 31st, 1923, said that it had been the company's policy to be in advance of the outward movement of residents from the city so that electricity could be installed while houses were being built, and that policy had been justified. Instead of erecting new steam plant, the company would in future take its power from the State Electricity Commission, and in this connection frequency changers were being installed. Two additional machines of this type, of 5,000-kW capacity each, had been installed during the year. The last of the steam plant, consisting of a 3,000-kW turbo-alternator and two large water-tube boilers, was in course of erection. An important portion of the Geelong tramway track had been duplicated, and preparations for the extension of the lines to North Geelong were in hand. The capital expenditure in connection with the Melbourne undertaking during the year was £280,600, and £105,400 had been spent in Geelong. For the next two or three years it was proposed to set aside sums to form a fund for the compensation of any officials who might lose their positions when the undertaking changed hands in 1925 or thereafter. There had been a large increase in the number of consumers, and the industrial-motor load had increased by 10,970 h.p. to 56,592 h.p. Although the cost of labour and material had increased considerably, the average income per kWh was still 8 per cent. less than was obtained prior to the war. At a subsequent extraordinary meeting the borrowing powers of the directors were increased by £900,000 to £2,250,000. The additional sum is required for extensions and other works for the next two or three years.

W. T. Henley's Telegraph Works Co., Ltd.

The report for 1923, which is being presented at to-day's annual meeting, states that the profit was £253,727. From this are deducted directors' and auditors' fees, debenture interest, and amount written off for depreciation on buildings, machinery, &c., £45,713, and to the balance is added £323,988 brought forward, making £532,002. Income tax absorbs £20,171; reserve account, £25,000; reserve against trustee securities, £1,156; dividend on preference shares, £9,000; and interim dividend on ordinary shares, £32,500; leaving an available balance of £444,175. The directors recommend a final dividend of 2s. per share, less tax (making 3s. for the year) on the ordinary shares (£65,000), leaving £379,175 to be carried forward. The report states that the business of the company continued to expand, and that the year was a record one from the quantity of the products manufactured and sold. The business of Henley's Tyre and Rubber Co., Ltd., resulted in a loss, owing to the competition from abroad.

Aron Electricity Meter, Ltd.

Owing to the general disorganisation of the company's interests due to the war, and the confiscation of its works in Germany, the company has been unable to present annual balance sheets for some years. Now, however, the directors have issued a statement of accounts covering the nine years to March 31st, 1923. The total amount received by the company up to date on account of its claim on the German Government is £286,636, less commission deducted by the Clearing Office for Enemy Debts, and £5,251, less commission, has still to be received. The profit and loss account for the nine years, after allowing for general and special charges, and depreciation, shows a net profit of £18,369, making with the balance brought forward at April 1st, 1914, and sundry reserves made prior to this date, not now required, and transfer of £15,000 from the reserve account, a total available profit of £42,947. As previously announced, a dividend of 36 per cent., less tax, is to be paid on the cumulative preference shares in respect of the years ending March 31st, 1915 to 1920 inclusive, absorbing £37,200, and the remainder is to be carried forward subject to corporation profits tax, additional income tax, etc. It is also recommended that a further dividend of 6 per cent. be paid on these shares for the year ended March 31st, 1921. The company's business in London has been proceeding normally, and it is hoped that the Austrian company will show a profit this year. The French company has been written off. The meeting is to be held on March 7th.

Metropolitan Electric Supply Co., Ltd.

The report for 1923 shows that £325,911 was spent on capital account during the year, bringing the total expenditure up to £3,008,188. The gross revenue increased by £74,637 to £631,724, and the working expenses by £7,740 to £271,643. The depreciation and reserve account is credited with £150,000, making a total of £650,000. The amount standing to the credit of the net revenue account is £210,081, and to this is added the balance from the last account, interest on dividends, etc., making a total of £240,650. After deducting debenture and loan interest, sinking fund appropriations, and dividend on the preference shares, there remains a balance of £120,189, from which £10,000 has been set aside to form the nucleus of a pension fund for the staff of the company. An interim dividend at the rate of 6 per cent. on the ordinary shares, amounting to £30,000, was paid in August last. The directors now recommend the payment of a final dividend at the rate of 14 per cent., making 10 per cent. for the year. This requires

£70,000, and a balance of £10,189 is carried forward. During the year new connections representing 4,626 kW were added to the company's system, and main transmission lines and sub-stations have been taken over from the Uxbridge and District Electric Supply Co., Ltd. The total connections at end of the year were 71,347 kW. Reference is made in the report to the London Electricity Supply (No. 2) Bill, and after the general meeting on March 4th, a further meeting will be held to consider and approve this.

Lancashire United Tramways, Ltd. The total traffic receipts in 1913 (including revenue from motor coaches and omnibuses) were £219,335, and receipts from the sale of electrical energy and from other sources amounted to £33,297, making £252,632. Working expenses absorbed £167,396; generating costs, £12,634; general charges, £11,073; and rent of leased lines, £5,191, leaving a gross profit of £56,338. Interest and dividends received from the operating company, &c., amounted to £103,117. After deducting motor coach and other expenses, interest on prior lien debentures, stock, &c., there remained a balance out of which interest was paid on the second mortgage debenture stock at the rate of 5 per cent., less tax, £431 remaining to be carried to depreciation account. After the payment of interest and dividend, the operating company had a balance of £14,184.

Prospectuses.—*Adelaide Electric Supply Co., Ltd.*—A prospectus has been published in the London Press (to comply with Stock Exchange requirements and for "public information only") relating to an issue of £350,000 5½ per cent. redeemable consolidated debenture stock which had been sold to the Electric and General Investment Co., Ltd., at £96 per £100 of stock.

British Columbia Electric Railway Co., Ltd.—This company has this week made a public issue of £770,000 five per cent. (income tax free) 1944 debenture stock, the price of issue being £95 (or $450) per £100. The list opened on Monday and was closed the same day.

Companies Struck off the Register.—The following companies have been struck off the Register, and are thereby dissolved:—

British Wolfram Co., Ltd.
Dawson Electrical Installations, Ltd.
Dene Battery & Accessories Co., Ltd.
Electro-Chemical Industries, Ltd.
G.M. Wireless Patents Syndicate, Ltd.
Hampstead Electrical Co., Ltd.
Holloway Electric Supply Co., Ltd.
London Armature Repair Co., Ltd.
Nazeing and District Electric Supply Co., Ltd.
New England Improved Ozonator Co., Ltd.
North Bolivia Power & Estates, Ltd.
Owen Magnetic Transmission Syndicate, Ltd.
Pontelec Welding Patents, Ltd.
Provincial Wireless Colleges, Ltd.
Pulverised Coal Supply Syndicate, Ltd.
Scottish Light Railways & Development Syndicate, Ltd.
Tungsten Products, Ltd.
Turbines, Ltd.

Charing Cross Electricity Supply Co., Ltd.—The directors recommend a final dividend on the ordinary shares of the West End undertakings of the company at the rate of 9s. 6d. per share, making, with the interim dividend already distributed, 14s. 6d. per share for the year. The directors further recommend that the sum of £96,000, part of the general reserve (income) account of the West End undertakings be capitalised and distributed among the holders of the ordinary shares in the form of one fully-paid ordinary share in respect of every five such shares held on March 1st, 1924. Prices to consumers are to be reduced.

Llandudno and Colwyn Bay Electric Railway, Ltd.—After meeting the costs of operation and administration, and providing for interest on debenture stock and loans, the profit for 1923 amounted to £4,324, and £1,084 was added from the last account, making an available balance of £5,408. Out of this there has been appropriated £2,240 for debenture stock redemption, and £1,500 for reserve account, leaving £1,668 to be carried forward.

Brompton & Kensington Electricity Supply Co., Ltd.—It is proposed to pay a final dividend at the rate of 10 per cent. (free of tax), making 10 per cent. for the year, equivalent to 15 per cent. on the original capital owing to the issue of a scrip bonus of 50 per cent. in the previous year. In that year 12 per cent. (less tax) was paid, as well as 7½ per cent. actual on the bonus shares.

Mexican Light & Power Co.—The gross earnings increased from $10,473,949 (Mex.) in 1921 to $13,193,435 in 1922, and the net earnings from $3,917,325 to $6,467,988. There was no surplus revenue, as after meeting fixed charges, contributions were made to capital expenditure. The Government and municipalities still owe the company large sums in respect of energy supplied to them.

Mexico Tramways Co.—The gross earnings for 1922 amounted to $12,942,416 (Mex.) as compared with $13,075,291 in 1921. The net earnings decreased from $2,335,436 to $2,097,917. The payment of the arrears of interest on the first mortgage bonds and the 6 per cent. mortgage bonds is said to be contingent upon the receipt by the Mexican Light and Power Co. of the large amounts owing to it by the Government and other authorities.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted:—

Electric Supply Corporation.—150,000 ordinary shares of £1 each, fully paid (Nos. 1 to 150,000); and 150,000 6 per cent. cumulative preference shares of £1 each, fully paid (Nos. 1 to 150,000).
Canadian General Electric Co.—6,842,250 dols common stock and 5,957,750 dols preference stock.
Canadian General Electric Co.—5,957,750 dols. preference stock.

Westminster Electric Supply Corporation, Ltd.—We regret to find that in our summary of this company's report and accounts in our issue of February 22nd (p. 308) we stated that the balance of the net revenue account included £86,163 brought forward. This was incorrect, as from that figure the dividend for the last half of 1922 had to be deducted, leaving only £17,116 brought forward.

National Gas Engine Co., Ltd.—The directors recommend the payment of a final dividend at the rate of 5 per cent. on the preference shares. This will absorb £6,000, and a balance of £18,450 is to be carried forward. There will be no dividend on the ordinary shares for the first time in the history of the company. Meeting to-day (Friday).

Bruce Peebles & Co., Ltd.—Dividends of 7½ per cent. per annum on the preference shares for the last half-year and a further dividend of 2½ per cent. per annum for the year, making 10 per cent. for the year, and a dividend for the year of 10 per cent. on the ordinary shares, together with a bonus of 5 per cent., all less tax.

Crossley Bros., Ltd.—According to the financial Press, the directors report a small trading profit for 1923. It is proposed to write off past losses and write down the assets and a scheme for the reduction of the capital is to be submitted.

Chelsea Electricity Supply Co., Ltd.—A final dividend at the rate of 15 per cent., making 12 per cent. for the year, is recommended. The previous year's distribution was 10 per cent.

International Light and Power Co.—Divided of 4½ per cent. (less British income tax) on the preference shares on account of arrears of dividends for nine months to March 31st, 1922.

Shawinigan Water and Power Co.—Dividend of 1¾ per cent. on the common shares for the quarter ending March 31st, as in 1923.

Hoffman Manufacturing Co., Ltd.—The directors recommend a dividend of 6 per cent. (free of tax) on the ordinary shares, £41,371 being carried forward.

Stocks and Shares.

MONDAY EVENING.

IT is now possible to make up the table of dividends declared by the London electricity supply companies for 1923. The results are, almost without exception, exceedingly good, and cannot fail to come up to the most sanguine expectations of optimists who looked for still higher distributions than those "banner" dividends declared in 1922. The comparison becomes more interesting with the addition of the 1921 figures, therefore we set out the three years' results, to show the extraordinary prosperity of the industry as reflected in the amounts paid to shareholders:—

Ordinary Shares.	Dividends. 1921. Per cent.	1922. Per cent.	1923. Per cent.
Brompton	12	12	10*
Charing Cross	9	14	14½†
Chelsea	6	10	10
City of London	14	15	15
County of London	8	10	15
Kensington	10	12	14
London Electric	4	10	10
Metropolitan	7	8½	10
St. James' and Pall Mall	12	14½	17½
South London	7	10	15
Westminster	10	12	15

* Tax-free † and share-bonus.

The Notting Hill Company paid 1,400 per cent. on its 1s. deferred shares, as against 1,000 per cent. a year ago. Customers also are considered in the matter, the Charing Cross Supply Company having published a further set of reductions to be charged in the West-end districts. There is a feeling that reason exists for cuts in other companies' prices. This is evidenced by the fact that the County of London Bill is being vigorously opposed by a large number of local authorities in the suburbs. The North Metropolitan Electric Power Supply is another company which is putting forward a Bill that is opposed by a large number of County Council and other bodies, including the County of London Electric, the North-Eastern Railway and the Gas Light and Coke Company. The Charing Cross Company is to distribute a scrip bonus of one new share for every five old at present held, which will necessitate the allotment of 96,000 new ordinary shares.

From the point of view of share quotations, the results tabulated above have had no particular effect upon the market since we last wrote. Prices, however, had risen very substantially beforehand, and the effect of the bumper dividends is discounted to some extent. It is possible, too, that some of the proprietors in electricity supply companies are asking whether the industry, as such, may not have reached its apex for the time being. The obvious answer is, that if the Bills now ready for Parliament are passed, and the companies receive an additional tenure of forty years' life from 1931, their position will be greatly fortified in so far as it concerns the holders of shares in the various undertakings.

The yields on electricity supply shares given in our table are calculated upon the middle prices. If inclusion of the dividends is allowed for, the returns will be, of course, higher.

The meetings of the tube railways have now been held, and Lord Ashfield had a good deal to say that was extremely interesting, on the subject of London traffic. The chief feature of present-day travelling in the Metropolis is, according to his speeches, the manner in which passengers are favouring the 'buses at the expense of the tubes. This would appear to be a natural reaction against the conditions which prevail by reason of the overcrowding of the Underground Railways, which, in spite of every effort to cope with the traffic, are still unable to run quickly enough during the rush hours to ensure people getting about comfortably. At the same time, the Metropolitan and the District are going ahead strongly in the way of increased traffic, and at the Metropolitan meeting a resolution was passed creating £2,000,000 of debenture stock already authorised. The issue is to be made at any time deemed by the directors to be favourable.

Several new issues have put in an appearance during the past business week. The British Columbia Electric Railway Company offered £770,000 in 5 per cent. tax-free debenture stock at 95. Compared with the company's present 5 per cent. preference stock, the new debenture looked extremely cheap, and the subscription-lists closed very promptly. There is likely to be a premium of several points on the stock as the market in it settles down. The Adelaide Electric Supply Company has published details, for public information, of a 5½ per cent. redeemable consolidated debenture stock amounting to £350,000, which the Electric & General Investment Company has bought at 96. No doubt the stock will be marketed in due course.

The Aron Electricity Meter report is out, and the meeting will be held next Friday, March 7th. The ordinary shares keep steady at 8s. 6d., and the preference, carrying 42 per cent. dividend, less tax, are still 22s. 6d.

Minor falls have occurred amongst Eastern cable stocks, but Marconi shares are distinctly better, in consequence of the idea that during this present week there will be published the report of the Committee that has been inquiring into the wireless position. On the hope that this will be favourable to Marconis, the shares rose to 2 1/16 and the preference advanced correspondingly to 1¼. Reactions of 1/16 took place as a few sellers came in. The improvement served to bring about a modest rise in Canadian Marconis to 6s. 3d. Radio shares are heavy, in consequence of steps which have been taken in the United States to ask Congress for an investigation of charges, made against the Radio Corporation of America, of being a trust monopoly of international air communication. Eight companies are said to be involved, including the General Electric of New York, the American Telephone & Telegraph Company, the Westinghouse Electric, and the Western Electric.

Henley's report shows that there was a loss on the operations of the tire subsidiary in 1923. The directors put this down to foreign dumping, and do not look for any immediate improvement. The main business of the company, however, has done so well that the trading profits are £4,400 up at £254,000 and the dividend on the ordinary shares is maintained at 15 per cent. Siemens have strengthened to 17s. 3d. Edisons at 4s. 9d. are threepence up. Engineering and allied shares hardened on the news of the Government's shipbuilding programme. Babcock and Wilcox gained 1s., rising to 48s.

Somewhat unaccountably a demand has sprung up for Anglo-Argentine Trams: both the first and second preference are ½ higher. Brazilian Tractions remain a strong market; an advance of 3 points left the price at 58½. The further recovery in the milreis is the inspiration for the buying, and the company's traffics are good. British Columbia Electric stocks shed from 1 to 3 in consequence of the new issue of cheap debenture stock. Mexicans have managed to hold their substantial gains of last week, and the 6 per cent. bonds of the Mexico Tramways Company are 4 to the good at 53½.

London Traction descriptions are none too firm. London United Tramways debenture is 1 lower; London and Suburban Traction preference dwindled to 6s. 6d. Yet the preference shares of the first-named concern are slightly better at 2s. 3d.

The "Electric Supply Share Handbook" (Effingham Wilson) by Herbert Blake, is a useful volume giving particulars of three dozen important companies connected with the industry. The London and the large provincial undertakings are set out with the accompaniment of all vital details relating to each concern. The book deserves a place in any financial library, and is published at 5s. net.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Dividend. 1921.	Dividend. 1922.	Price Feb. 25, 1923.	Rise or fall.	Yield p.c.
	£					
Brompton Ordinary	1	12	12	43/6	−1/-	*£4 12 0
Charing Cross Ordinary	5	9	14	14½	+½	5 0 0
do. do. do. 4½ Pref.	5	4½	4½	4½	—	5 0 3
Chelsea	1	6	10	38/9	—	5 3 2
City of London	1	14	15	47/6	−½	6 6 4
do. do. 6 % Pref.	1	6	6	22/-	+1/-	5 4 4
County of London	1	8	10	2¾	+⅛	6 9 10
do. do. 6 % Pref.	1	6	6	23/6	—	5 6 1
Edmundson's Ordinary	5	Nil	7	9½	—	5 14 9
do. 6 % Pref	5	12/-	6	4½	—	6 3 0
Kensington Ordinary		10	12	10½	—	6 13 4
London Electric	5	4	10	5	—	6 0 0
do. do. 6 % Pref.	5	6	6	5½	—	5 9 1
Metropolitan	1	7	8½	1¾	—	5 14 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary	1	Nil	9½	17/-	—	2 18 10
do. 5 % Pref.	1	5	5	15/6	—	6 9 0
do. 7 % Pref.	1	7	7	23/-	—	6 1 9
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref.	1	6	6	22/-	—	5 9 1
Urban Ordinary	1	Nil	—	17/3	—	Nil
do. 6 % Pref.	1	2½	5	17/6	—	6 17 1
St. James' and Pall Mall	5	12	14½	13½	—	6 9 8
South London	1	7	10	44/-	+1/-	6 16 4
South Metropolitan Pref.	1	7	7	24/6	—	5 14 4
Westminster Ordinary	5	10	13	10½	—	6 18 0
Whitehall Elec. Invst., 7½ % Pf.	1	7½	7½	1	—	7 10 0

HOME RAILS.

Central London Ord. Assented	Stock	4	4	68½xd	−1	5 16 10
Metropolitan	,,	2½	3½	77	+1	5 4 6
do. District	,,	1	3	56	−½	6 5 0
Underground Electric Ordinary	10	Nil	Nil	2	−½	Nil
do. do. "A"	1	Nil	Nil	6/-	—	Nil
do. do. Income Bonds	£	5		108	—	*5 16 0

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 14 9
do. Def.	,,	1½	34/6	22½	—	6 11 10
Chile Telephone	£	6	6	5½	—	5 8 6
Cuba Sub. Ord.	10	7	7	7½	—	9 13 4
Eastern Extension	10	10	10	16¾	+½	5 18 6
Eastern Tel. Ord.	Stock	10	10	168½	−2	5 18 8
Globe Tel. and T. Ord.	10	10	10	17½	—	5 16 0
do. do. Pref.	10	6	6	11	—	5 9 1
Great Northern Tel.	10	24	22	32½	—	7 14 4
Indo-European	25	10	7	22½	—	*5 7 4
Marconi	1	25	15	2	+⅛	7 10 0
Oriental Telephone Ord.	1	15	12	1¼	—	*5 8 0
United R. Plate Tel.	£	8	8	6¾	—	*5 16 6
West India and Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	16¾	−½	*5 18 6

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams. First Pref.	£	6½	13½	3⅞	+½	6 6 0
do. do. 2nd Pref.	£	Nil	8½	2½	+½	10 13 4
do. do. 5% Deb.	Stock	£	£	74	—	6 15 3
British Electric Traction Ord.	,,	4½	5	72	—	6 19 9
do. do. 6% Pref.	,,	£	£	98½	—	6 1 10
Brazil Traction	100	Nil	4	58½	+3	6 16 9
Brit. Columbia Elec. Rly. Pcs.	Stock	£	£	87½	−1	5 11 9
do. do. Preferred	,,	£	98/-	87½	−2	*5 10 0
do. do. Deferred	,,	£	127/-	101¢	−2	*5 8 0
do. do. Deb.	,,	4½	4½	77½	−3	5 9 8
Lond. & Sub. Trac. 5 % Pref.	1	3½	5	6/6	−6d.	7 13 10
London United Tram. Deb.	Stock	4	4	55	−1	7 5 6
Mexico Trams 5 % Bonds	—	Nil	Nil	76	—	6 11 6
do. 6 % Bonds	—	Nil	Nil	53½	+4	Nil
Mexican Light Common	100	Nil	Nil	2½	—	Nil
do. Pref.	100	Nil	Nil	40½	—	Nil
do. 1st Bonds	—	Nil	£	68½	+1	7 6 0

MANUFACTURING COMPANIES.

Babcock & Wilcox	1	15	20	48/-	+1/-	*4 8 4
British Aluminium Ord.	1	10	£	22/-	—	4 11 0
British Insulated Ord.	1	15	15	9⅞	—	5 17 0
Callenders	1	15	15	48/3	—	6 4 6
do. 6½ Pref.	1	6½	6½	94/3	—	6 7 3
Crompton Ord.	1	10	£	½	—	10 0 0
Edison-Swan	4/-	10	Nil	4/9	+3d.	6 6 4
do. do. 5% Deb.	Stock	£	£	75½	—	6 13 5
Electric Construction	1	10	10	80/-	—	6 13 4
English Electric	1	£	£	17/6	—	5 14 3
do. do. Pref.	1	6	6	1	—	6 0 0
Gen. Elec. Pref.	1	6½	6½	92/3	—	5 15 7
do. Ord.	1	10	£	90/3	—	4 19 0
Henley	1	15	15	2⅛	—	6 8 0
do. 4½ Pref.	£	4½	4½	4½xd	—	5 9 1
India-Rubber	1	10	—	½	—	*6 13 4
Met.-Vickers Pref.	£	6	6	2⅞	+ ⅛	6 5 0
Siemens Ord.	1	10	10	17/3	+£d.	Nil
Telegraph Con.	13	20	20	24	—	*5 0 0

*Dividends paid free of Income Tax.

Trade Conditions in Brazil.

In view of the visit to Brazil of a number of London bankers for the purpose of advising the Government at Rio, the issue by the Department of Overseas Trade of a report on economic conditions in Brazil is opportune. The report has been written by Mr. E. Hambloch, His Majesty's Commercial Secretary, and has been brought up to September, 1923. Despite the fact that the financial situation of Brazil is difficult and even critical, Mr. Hambloch points out that the general condition of the country is sound. The excess of exports over imports has been large and in terms of currency the trade balance has been even more favourable than at first appears.

The report refers to the changes taking place in Brazilian investments. Formerly, local capital found its almost exclusive employment in houses and land, now there is an increasing tendency for local finance to interest itself in industrial undertakings, for which, of course, foreign machinery and foreign technical help are needed. It may be inferred that this recourse to national capital should result in a more accommodating spirit being shown to the undertakings that are being operated by foreign capital. In Mr. Hambloch's opinion Brazil can soon overcome her present difficulties if she practises economy and works hard as a nation and in her individual life. Much, however, will depend on the Government's having the courage and being allowed to carry out a programme of real economy and on its having the foresight to attract foreign capital to Brazil by offering adequate guarantees for its employment.

Iron and Steel Industry.

This question of adequate official support is apparently one that still remains unanswered in connection with the development of an iron and steel industry in Brazil. Brazil possesses abundant supplies of iron and manganese, yet the various schemes for exploiting these have not had very fruitful results. There seems to be an absence of a really definite policy. For instance, the exportation of iron ore has been opposed for fear that the establishment of iron and steel manufacture within the country would be delayed, but on the other hand, nothing practical seems to have been done to secure the establishment of such an industry on a reasonable scale. The report points out that meanwhile the Cia. Electro-Metallurgica de Ribeirao Preto, in Sao Paulo, is producing steel by the electrical process and using charcoal. In the first half of 1923 it produced about 6,000 tons of steel bars and rods; its output will be greater when more power, now being installed, is available. The output of the Cia. Belgo-Mineira, in Sabara (Minas Geraes) is small and somewhat irregular.

There are grave difficulties in the way of the successful working of the iron and steel industry in the interior of Brazil, *i.e.*, at an undue distance from the coast, one of the chief difficulties being lack of transport facilities and labour. In any case the existence of such works does not solve the problem of this industry in Brazil.

Mr. Hambloch further records that the Brazilian Government has under consideration the proposals of a British group to establish iron and steel works on a large scale not far from Rio de Janeiro.

Hydro-Electric Development.

With regard to hydro-electric development Mr. Hambloch points out that the Rio Tramways, Light and Power Company is developing fresh power at Rombos on the River Parahyba, some distance from Rio de Janeiro This development has in view the supply of the increasing demand for power and light in the Federal district, already supplied by this concern from its installation at Ribeirao dos Lages. Small local developments and the addition of new sets to existing installations are recorded, especially in the States of Sao Paulo and Minas Geraes. Tenders have been invited for the harnessing of the Jacuhy falls, in the State of Rio Grande do Sul. The falls are estimated to be capable of developing 40,000 h.p., but the present potential consumption of power from this development is small. By Decree No. 6273, dated March 23rd, 1923, the State Government issued regulations governing the concession, use, and development of such waterfalls as belong to the State, of such as are situated in undeveloped land and of such as, being privately owned, have been expropriated for public utility. There are over 100 regulations, but the most important would appear to be that concessions of falls for development are to be *gratis* and for a limited period, *viz.*, from 30 to 60 years; that at any time after 20 years the State may take over the hydro-electric installation by payment in cash or in State bonds; that in any case at the end of the contractual period the falls and installation shall revert to the State Government, without payment of any indemnity to the concessionaire, and that in case the installations be taken over by the State before the end of the contractual period, the value of the water-fall shall not be included in the price paid by the State for the expropriation of the installations. The development and, equally important, the cheapening of the supply of electric power, of which enormous quantities are available, will contribute to increase manufacturing production in Brazil which must in the future be regarded not only as a country of enormous agricultural and pastoral resources, but as an ever-growing centre of industry.

Turbine Construction.

An important development is the manufacture of turbines by a small but well-equipped local factory which has a working arrangement as regards designs and patents with some important United States manufacturers. The only imported material used consists of forgings, plates and sections. All other material is obtained in Brazil and Brazilian workmen give satisfaction.

Railway Electrification.

The report proceeds to summarise the progress of railway electrification. It states that the project to electrify the suburban section and part of the main line of the Central of Brazil Railway was not carried into effect by the late Government, though a special loan of 25,000,000 dollars for that purpose was raised in the U.S.A. The scheme is still under consideration, but the money from the loan referred to is no longer available, and it is not known for what purpose the late Government spent it. Two British and two American groups presented tenders. Electrification is an urgent necessity if the railway is to cope successfully with the continuous increase of its traffic. The number of passengers carried in 1915 was 650,000,000, and in 1921 it had reached 1,175,000,000.

The Paulista Railway has converted a section of its main line (from Jundiahy to Campinas, 45 kilometres) to electric traction, and is now electrifying a further section of 50 kilometres, from Campinas. The contract was given to an American firm. The State Government of Sao Paulo has appointed a commission to investigate and present plans for the electrification of the Sorocobana Railway. The electrification of the Campos de Jordao Railway was awarded, after a public call for tenders, to a British company, in competition with American, German and Swiss groups.

Treatment of Capitalists.

The Commercial Secretary gives a list showing the estimated revenue per kilometre of various railways in Brazil, which he points out explains some of the difficulties experienced by railways, such as the Leopoldina and the Great Western of Brazil. Some of the lines are large coffee carriers and coffee is a commodity which can afford to pay freight rates that are remunerative to the railways. The two railways mentioned derive little advantage from this source and any suggestion that their rates should be raised always meets with opposition from interested parties. Mr. Hambloch says that ability or inability to pay is not often tested, because the Government generally refuses permission for the increase. He adds that if these railways, therefore, are not to be treated on a purely commercial basis, *i.e.*, if they are not allowed, within reason, to raise their rates when circumstances compel them to do so, then they should be considered as political-economic concerns acting as public utility agents in the zones which they serve and which cannot themselves afford to pay for the benefits they derive from railway transport. There is a limit beyond which freight-rates cannot be raised without reducing traffic receipts, but the requests of the railways in question have usually been quite moderate. If, however, dislocation and stoppage of local production is feared as a result of increases in freight-rates, then it is clearly no more than just that the public authorities which forbid the application by the railways of commercial measures should devise some other form of compensation for the railway companies.

There will be general agreement with Mr. Hambloch's view that it is not to be expected that foreign capital, in these cases British, should be engaged in developing large tracts of country, by means of railway transport, without its due reward. That is a service which the body politic should, in such cases, undertake in the interest of the whole nation and shoulder the financial responsibility therefor by guaranteeing in some form or another that the foreign capital so employed shall receive a reasonable interest for its investment. A large proportion of Brazil's railway system was constructed under a system of guarantee of interest on the capital employed, and this was found much more successful than the kilometre subsidy, which often led to abuses. The difficulties of the railways in question have been rendered even greater by the low rate of exchange of milreis, so that even where receipts have increased the net available sums remitted in sterling have been woefully small.

Wireless Telegraphy.

Although there are no Brazilian stations for wireless telegraphy which have a very large radius, radio communication is maintained with Bolivia and Peru. The report points out that the first public installation was inaugurated on the peak of the Corcovado mountain (Rio de Janeiro) in September, 1922. The Companhia Nacional de Communicações sem Fio, under British auspices, is installing a powerful station a few miles from Rio de Janeiro, and radio-telegraphic communica-

tion between Brazil and all the other countries of the world will, as a result, be definitely established. On September 5th, 1923, the Brazilian Press began to receive a wireless news service from France through the Sociedade Nacional Radio-electrica.

With regard to submarine work, the cable between Para and Manáos was laid by Messrs. Siemens Bros., of London, some years ago. From Manáos to the interior of Amazonas and the Acré district telegraphic communication is carried on by radio-telegraphy, and there are 10 stations in that district.

THE IMPORT TRADE OF BRAZIL.

The following figures showing Brazil's imports of electrical and allied goods in 1922 have been taken from the official returns. The corresponding figures for 1921 have been given for purposes of comparison, and notes of increases or decreases added :—

	Metric tons. 1921.	1922.	Inc. or dec.
Dynamos and electrical generators.—			
Total	670	360	− 310
From Great Britain	40	60	+ 20
,, United States	470	160	− 310
,, Germany	115	50	− 65
Electric motors.—			
Total	1,630	1,370	− 260
From Great Britain	545	150	− 395
,, United States	85	130	+ 45
,, Switzerland	120	120	− —
,, Germany	770	620	− 150
Apparatus for electricity and electric light.—			
Total	2,590	2,690	+ 100
From United States	1,290	970	− 320
,, Great Britain	470	380	− 90
,, Germany	470	840	+ 370
Transformers.—			
Total	730	460	− 270
From Great Britain	10	45	+ 35
,, United States	570	220	− 350
,, Germany	115	160	+ 45
Copper wire, insulated.—			
Total	600	1,230	+ 630
From United States	330	450	+ 120
,, Great Britain	10	160	+ 150
,, Germany	130	380	+ 250
Electric cable.—			
Total	1,920	1,400	− 520
From Great Britain	960	830	− 130
,, United States	260	300	+ 40
,, Germany	140	110	− 30
,, Belgium	—	110	+ 110
Telegraph and telephone posts, bridge and fence material.—			
Total	3,300	7,540	+ 4,240
From Great Britain	1,180	1,560	+ 380
,, United States	1,710	3,050	+ 1,340
,, Belgium	65	1,030	+ 965
Machinery and apparatus, not textile or agricultural.—			
Total	14,110	11,120	− 2,990
From Germany	3,920	4,700	+ 780
,, United States	4,700	2,820	− 1,880
,, Great Britain	2,490	2,190	− 300
Hydraulic pumps and accessories.—			
Total	510	400	− 110
From Great Britain	120	100	− 20
,, United States	230	190	− 40
,, Germany	100	60	− 40
Industrial machinery, unspecified.—			
Total	9,250	4,730	− 4,520
From United States	2,280	290	− 1,990
,, Germany	2,390	1,260	− 1,130
,, Great Britain	1,640	640	− 1,000
,, France			

Hydro-Electric Progress in Canada during 1923.

That the year 1923 was one of marked activity in the development of Canada's water power resources is evidenced by a review made by the Dominion Water Power Branch, Department of the Interior, of the principal undertakings from coast to coast. This indicates that some 255,000 h.p. was added during the year, bringing the total water power installation in Canada to 3,228,000 h.p. The most significant feature, however, is the large number of projects actually in progress of construction or actively in prospect. These projects when complete will add to Canada's total more than 900,000 h.p.

British Columbia.

Hydro-electric construction activities were carried on in British Columbia during 1923 at widely separated points. In the northern coastal district the Granby Consolidated Mining and Smelting Company completed the construction of a large storage dam on Falls creek and added a 5,000-h.p. set to its hydro-electric station. The Pacific Mills, Ltd., at Ocean Falls, also extended their water storage facilities by raising their dam an additional 15 feet and added a new 6,300 h.p. set to their station. The work carried on for the past two years by the British Columbia Electric Railway Company in raising its dam at the outlet of Stave Lake was completed during 1923, and plans were laid for extensive new developments on the Stave river which will yield an additional 115,000 h.p. In this connection tenders were being called for towards the end of 1923 for a new set of 25,000 h.p. to be erected and in operation during 1924. The East Kootenay Power Company actively carried on the construction of a new plant on the Elk river, near Elko, to have an initial installation of 15,000 h.p. and an ultimate capacity of 24,000 h.p. With regard to prospective developments it has been stated that the West Kootenay Power and Light Co. is planning to double its capacity at Bonnington Falls on the Kootenay river. It is also of interest to record a comprehensive report made by Kerry & Chace, Limited, consulting engineers for the City of Vancouver, with regard to a systematic development of adjacent water powers by the city.

Alberta.

The only hydro-electric project proceeded with in Alberta during the year was a small development undertaken by the Dominion Parks Branch of the Department of the Interior on the Cascade river for the supply of Banff. This installation of 960 h.p. was nearing completion at the end of the year. A new contract was made by the Calgary Power Company with the City of Calgary for a term of five years which was mutually advantageous to both parties, the company agreeing to construct an additional transmission line during 1924 from its power plant on the Bow river to the city.

Manitoba.

The initial stage of the Manitoba Power Company's hydro-electric development on the Winnipeg river at Great Falls was brought to completion, and two 28,000 h.p. sets are now in operation. Plans are under way for the addition of a third set of similar capacity during 1924. The ultimate installation will comprise six units. The City of Winnipeg, towards the end of 1923, awarded a contract for three new sets of 7,000 h.p. to be installed in the municipal hydro-electric station at Point du Bois on the Winnipeg river. This will bring the total capacity to 82,000 h.p., with provision still remaining for two additional sets.

Ontario.

The development work of the Ontario Hydro-Electric Power Commission ranked first in Ontario during the year. At the Commission's Queenston plant on the Niagara river two new 55,000 h.p. sets were brought into operation. It is expected that units Nos. 7 and 8 will be installed in 1924, which will bring the capacity to 440,000 h.p., the ultimate total of from 550,000 to 600,000 h.p. being reached by 1926. A new 20,000 h.p. set was installed in the Ontario Power Company's plant operated by the Commission at Niagara Falls, this unit replacing a similar one which was destroyed in 1921. A new plant of 1,200 h.p. was constructed at Bingham Chute on the South river, to serve the Nipissing system, and work was started on the installation of a new pipe line at Eugenia Falls. On the Trent river construction was commenced of two new developments, at Dams 8 and 9, of 6,600 h.p. and 4,800 h.p. respectively. These will serve the Central Ontario system, and are expected to be in operation in 1924. Operations were also commenced on the addition of two new 12,500-h.p. sets in the Cameron Falls station on the Nipigon river, to serve the Thunder Bay system. In the mining district of Northern Ontario the Northern Canada Power Company brought into operation its 8,000-h.p. plant at Sturgeon Falls, on the Mattagami river, to serve the gold mines in the Porcupine area. The Great Northern Power Company also brought into operation its station at Indian Chute, on the Montreal river, with two sets of 2,000 h.p. each. This company plans to add a similar unit in 1924. Construction was started of a 25,000-h.p. development by the Hollinger Consolidated Gold Mines, Ltd., at Island Falls, on the Abitibi river, with the expectation of delivering power at the Company's mine and mill in 1924. The Spruce Falls Company completed a 2,500 h.p. development at Kapuskasing, on the river of the same name, for use in connection with a sulphite pulp plant at that point. In the Kenora district the Backus-Brooks Company installed two

additional 1,200-h.p. units in its plant at Kenora, and with four more of the same capacity installed early in 1924 the station will have a total capacity of 12,000 h.p. for use in connection with the company's pulp and paper mill. The Dryden Paper Company also completed an installation of 1,400 h.p. on the Wabigoon river.

Quebec.

In Quebec construction operations were actively carried forward on numerous developments, several being of large magnitude. At the Cedars plant of the Montreal Light, Heat and Power Consolidated on the St. Lawrence river, two sets of 11,300 h.p. each were added, and two further sets of the same capacity are to be added this year, which will bring the total capacity to 200,000 h.p. The St. Maurice Power Company achieved remarkable progress in the construction of its 120,000-h.p. development at La Gabelle on the St. Maurice river, and expects to deliver power during April this year. The Southern Canada Power Company awarded the contract for a 37,800-h.p. development at Hemming Falls on the St. Francis river, and construction work was placed under way. It is expected to have this plant ready for operation early in 1925. In the Ottawa district the Ottawa River Power Company commenced the construction of a development at Calumet Falls on the Ottawa river near Bryson, Quebec. This plant will have an initial installation of one or two sets of 22,500 h.p. each and an ultimate capacity of 67,500 h.p. The initial installation is to be ready for operation by January, 1925. In the Lake St. John region the largest individual development in the province is under way at the Grand Discharge on the Saguenay river. This plant, which is being constructed for the Quebec Development Company, is to have an initial installation of 320,000 h.p. Good progress was made on the work of construction during 1923. The plant is expected to be in operation early in 1926. In the same region Price Brothers and Company, Ltd., completed the installation of an 11,000 h.p. development on the Chicoutimi river for use in their paper mills at Kenogami. The town of Jonquiere is also installing a 1,800-h.p. addition in its plant on the Au Sable river. On the south shore of the St. Lawrence the Lower St. Lawrence Power Co. completed a hydro-electric installation of 3,700 h.p. on the Metis river to supply the district extending from Rimouski to Matane. A small development of 550 h.p. was also installed by the Town of Megantic on the Chaudière river. On the lower north shore of the St. Lawrence, the St. Regis Paper Co. commenced the construction of a 600-h.p. plant two miles east of Godbout river. In the north-western part of the province the Northern Canada Power Co. secured a lease from the Quebec Government of a site on the Quinze river and immediately commenced construction. The initial installation of 20,000 h.p. is expected to be completed in 1924 when the power will be transmitted for use in the gold mining district of Northern Ontario. Among other water power activities in Quebec during 1923 may be mentioned a development for the Laurentian Hydro-Electric, Ltd., on the East Branch of the North river—1,865 h.p.; a new development of 1,200 h.p. for J. C. Wilson, Ltd., on the North river near St. Jerome; an addition of 4,500 h.p. to the plant of the Portneuf Hydraulic Company at St. Alban on the Ste. Anne de la Perade river; a 600-h.p. hydro-electric plant replacing a water-works plant at Buckingham on the Lievre river, and a 1,350 h.p. hydro-electric plant on Mars river near Bagotville. In addition to those actually under construction, a number of water power projects are in active prospect in different parts of Quebec province. These include a 15,000-h.p. plant on the Batiscan river; a plant of 80,000 h.p. at Lachine rapids on the St. Lawrence river; a 50,000-h.p. development on the Des Prairies or Back river; two projects on the Gatineau river, the first at Chelsea of 110,000 h.p. and the other at Paugan Falls of 60,000 to 100,000 h.p.; a development on the Megiskan river in Northern Quebec of from 10,000 to 20,000 h.p. in connection with a pulp and paper mill; and a 21,000-h.p. plant on Du Loup river, Maskinonge county, near St. Paulin. Of great importance to hydro-electric development in the Province of Quebec is the work of the Quebec Streams Commission. The Commission has carried out most valuable storage works such as the Gouin reservoir on the St. Maurice river, the Allard reservoir on the St. Francis river, and reservoirs on the Ste. Anne de Beaupré river. It is engaged at present on a $2,500,000 dam at Lake Kenogami in the Saguenay district, which will most beneficially regulate the flow in the Chicoutimi and Au Sable rivers to the advantage of the pulp and paper industries at Chicoutimi and Kenogami. The Commission also has under way storage improvements in the basin of the Metis river at an estimated cost of $200,000. Another storage reservoir which was recently completed with the approval of the Commission was one on Lake Jacques Cartier, to regulate the flow of the river of the same name.

New Brunswick.

At Aroostook Falls on the Aroostook river, the Maine and New Brunswick Power Company completed extensive alteration to its hydro-electric development and replaced two old units of 750-h.p. capacity each by new sets of 2,000 h.p., thereby bringing the total capacity of the plant to 8,400 h.p. A transmission line taking power from this plant is under construction, running from Bridgewater, Maine, to Woodstock, N.B., *via* Lakeville, Centreville, and Hartland. The largest power site in the Maritime Provinces, Grand Falls, on the St. John river, has been under study by the New Brunswick Electric Power Commission during the year with the possibility of development being undertaken if all conditions are found favourable.

Nova Scotia.

The most notable construction work in Nova Scotia during 1923 was that carried on by the Nova Scotia Power Commission at Malay Falls on the East River Sheet Harbour. This development, which comprises three sets with a total capacity of 5,500 h.p., was well advanced during the year and is expected to be in operation early in 1924, when power will be transmitted for use in a number of towns in Pictou county. Final arrangements were also made by the Commission for a second development on East River Sheet Harbour to furnish power to the Albany Perforated Wrapping Paper Company, of Albany, N.Y., for a pulp and paper mill at West River Sheet Harbour. This development, which will have an initial capacity of 6,000 h.p., with provision for an increase to 9,000 h.p., is of particular interest inasmuch as it is attracting a new industry to the province. The Avon River Power Company practically completed a development of 2,300 h.p. on the Avon river to serve the town of Windsor.

The Electrical Wholesalers' Federation.

Annual Luncheon.

THE annual luncheon of the Electrical Wholesalers' Federation was held at the Hotel Russell, W.C., on February 1st, when many members and visitors were present.

After an excellent *menu*, the president of the Association, Mr. G. Donovan, proposed the toast of "Kindred Associations," dealing *seriatim* with the bodies who had sent representatives. He congratulated the Electrical Contractors' Association upon its trading policy, which, he said, would have a beneficial effect upon factors as well as contractors. Referring to the Electric Lamp Manufacturers' Association, he said that although discounts were not so good as they would like, he hoped sales would grow until the deficiency in this respect was made up by increased profits on a larger turnover. He regretted that Mr. Ll. B. Atkinson, who was to have represented the Cable Makers' Association, was prevented by illness from attending. Mr. Donovan mentioned the British Electrical and Allied Manufacturers' Association in a more jocular manner, and professed not to understand its systems and methods of working. Finally, he referred to the British Electrical Development Association which, he said, was entitled to the sympathy and support of all branches of the industry.

Mr. ROBERT ROBSON, replying for the Electrical Contractors' Association, said that he wished to see the continued growth of the Associations, but he thought that the industry needed a co-ordinating association, an office which the E.D.A. might perform. In dealing with his Association's activities, he mentioned the recently-introduced registration scheme for which he asked for support. Those with work to be done should see that only registered contractors were employed. The Association's trading policy was being successfully carried out. Finally, he made an appeal to his hearers to use British-made material.

Mr. E. A. GIMINGHAM, in responding on behalf of the Electric Lamp Manufacturers' Association, spoke of the importance of educating the public in electrical matters—a subject to which the various Associations should give attention. He said that the view must be taken that trade associations did not exist for trade purposes only, but for the good of the public.

Mr. DUNLOP, who replied to the toast on behalf of the British Electrical and Allied Manufacturers' Association, did not think that another association was needed; the existing associations should give each other more frequent opportunities for intercourse. Each should arrange, at least, an annual function at which the others could be present. The policy of the B.E.A.M.A. was not obscure, but it must be remembered that the Association consisted of about twenty different groups each with its own problems. It was a world-wide organisation and had raised the status of the industry in many ways. He thought that an endeavour should be made to use British goods only, but he realised that manufacturers must make it worth the factor's while to sell British goods.

Mr. S. H. CALLOW proposed the toast of "The Electrical Wholesalers' Federation," saying that he considered it the best organised of all the electrical associations. This was perhaps due to its formation at a time when the industry was in an advanced stage of development.

In reply, Mr. DONOVAN said that the E.W.F. was anxious to live in amity with all the other bodies in the industry. He claimed that it had been a power for good in the elimination of unfair, "cut-throat" competition, and the extinction of contractors who posed as factors and *vice versâ*.

Mr. A. G. BEAVER proposed the toast of "The Electrical Press" in felicitous terms, and Mr. R. W. HUGHMAN (*Electrical Times*) humorously responded.

In conclusion, Mr. ALBRECHT thanked the chairman for presiding at the luncheon, and the members of the Federation adjourned for their general meeting.

Tramways and Roadways.

The Advantages of Traffic Segregation.

By T. MOLYNEUX, M.B.E., M.I.Mech.E.

(*Abstract of paper read before the* LIVERPOOL ENGINEERING SOCIETY.)

THERE are approximately 250 tramway undertakings in Great Britain, 170 of which are owned by local authorities and the balance by companies. The total route mileage is approximately 2,580, roughly two-thirds being owned by local authorities and the remainder by companies. Of this total mileage, more than 2,500 is operated by electric traction—the small balance of less than 80 being divided amongst other methods which include steam, cable, petrol motor, gas motor, and horse. Gauge of track includes 3 ft. 6 in., 4 ft., 4 ft. 7½ in., and 4 ft. 8½ in., the last (which may be considered standard) amounting to approximately 60 per cent.—25 per cent. being of the narrowest, and 15 per cent. being divided between the two middle dimensions.

The Tramways Act of 1870, which imposes on the tramway undertaking the important liability of restoring the surface of the road after the construction of a tramway, and also at the undertaking's own expense at all times to maintain in good repair, with such materials and in such manner as the road authority shall direct, so much of the road as lies between the rails and 18 inches beyond, may have been reasonable under the wear and tear of animal traction, but is harsh under electric systems. The argument appears sound until other aspects are reviewed. The breaking up of the continuity of the surface of a roadway by the insertion of other materials for a particular and exclusive type of vehicle would impose on the road authority additional expense, and the legislature has very rightly transferred the additional cost so arising to the undertaking which seeks to use a part of the road exclusively.

In the course of the next few months nearly 40 miles of the Liverpool track will have been constructed as enclosed or separate track, out of a total of approximately 160 miles, equivalent to 25 per cent. of the whole; whilst out of the same total length 120 miles or 75 per cent. will have been constructed or reconstructed with the deep grooved rail suitable for high-speed service. A speed of 20 miles per hour has been sanctioned on the special track; it is confidently hoped that still higher speeds will be allowed in the near future.

There appears to be no doubt that the considerable amount of time saved daily by the introduction of high speed has become a lively factor in inducing people to live at greater distances from their daily work and pursuits, in more open and freer spaces and away from congested areas, and as this appreciation of healthier surroundings grows, so will the demand for still higher speeds make itself felt as a time saver so that the fullest possible benefits can be obtained.

Whether the electric tramway system will meet the call for yet higher speeds over longer distances is a matter for very careful investigation, but it has serious rivals.

The petrol motor 'bus as a passenger-carrying vehicle in large centres of population has, owing to various causes, some fortuitous and not necessarily on merit, made rapid strides.

The electric trolley 'bus, or railless car system, is comparatively cheap to install, but like the tramway has the disadvantage that the vehicles are limited to the wired route, and a breakdown at the generating station forces the whole service out of action. There is a further disadvantage from the road authority's standpoint—namely, that inherently the vehicles are driven as far as possible in the one course, and there is therefore a tendency on inferior class roads to form ruts in the surface. The electric and steam railways under certain conditions and circumstances prove very formidable rivals. For serving outlying districts, their own private right of way gives them the advantage of very high average speeds and very high capacity. To obtain these advantages, heavy initial expenditure has to be faced for the accommodation of other traffic. Indeed, it may be said that whereas railways shun level crossings, the whole length of the tramway is one continuous level crossing.

The average economical length between suburban railway stations is about one mile; the average length between stops in ordinary tramways is about 200 yards; the minimum aimed at in the newer developments is a quarter of a mile, and if this can be obtained in practice then something like an average speed of 20 miles per hour throughout, say, a journey of from 5 to 10 miles can be maintained, involving in the latter case a time of only 30 and in the former of 15 minutes.

The various advantages and disadvantages of the systems just enumerated might be summarised as follows: The capital expenditure required to install a petrol motor 'bus service is the least of any; the expenditure to install the different services increases in the following order: electric trolley 'bus, electric tramway, steam railway, and the greatest expenditure of all is for the electric railway, whether ordinary or an elevated structure, or below ground as either a subway just below the surface or in a tunnel or tube at greater depths.

Working expenses, reckoned per seat provided, are the least on the electric railway, with the tramway second, and the trolley 'bus is cheaper than the motor 'bus. Combining charges on capital with working expenses, the electric tramway is least, with the trolley 'bus better than the petrol vehicle, with the electric railway probably giving more satisfactory financial results than the steam one.

Capital Costs per Mile.

Tramway	£50,000
Motor omnibus	£8,000
Tube railway	£650,000
Ordinary railway	£525,000
Tramway average throughout Great Britain	£33,000

Costs per seat-mile.	Capital pence.	Working pence.	Total pence.
Tramway	.071	.183	.254
Motor omnibus	.068	.412	.480
Tube railway	.173	.139	.312

Costs per seat-mile. (provincial)	Pence capital.	Pence working.	Pence total.
Tramway	.031	.230	.261
Motor omnibus	.027	.532	.559

Costs per passenger carried (provincial)	Pence capital.	Pence working.	Pence total.
Tramway	.18	1.100	1.29
Trolley 'bus	.16	1.280	1.44

In considering their relative advantages and conveniences to the user, speed is decisive. The two 'bus systems operating on the ordinary street and highway are unable to give more than an average speed of from eight to ten miles per hour. The steam train will improve on this to something like 16 miles per hour, and the electric train still better by giving an average speed of from 20 to 25 miles per hour. Of course, street surface 'bus systems are not only subject to interference from other traffic, but also deliberately cater for the exigencies of the public by setting down and taking up passengers at more frequent intervals than the railway systems.

Systems operating on the ordinary street surface are better adapted for the short-distance rider, whereas railway systems suit persons who live at a much greater distance, but tramways in separate tracks, having some of the advantages of both, can meet the ordinary requirements of both classes.

The short-distance rider would appear to have the advantage in being able to obtain the most economical transport. Street surface systems of the low average speed type of 'buses cannot meet the long-distance case, and it is not good policy to discourage the development of outer areas by imposing systems which need high fares to recoup heavy capital expenditure. In the wide road movement which is so active at the present time lies a means of considerably improving the prospects of the two 'bus systems, and if the principle of setting aside a strip of the highway is followed, the average speed of such systems will be increased and their usefulness very much improved.

Railway systems, by their necessarily heavy capital expenditures, and the two 'bus systems, by insecurity at the necessary high speeds (although enjoying, may be, the rights of private way) are all wanting as satisfactory instruments for dealing with large masses of the population. The electric tramway system, if endowed with the advantages of the railway's high average speed, fewer stops, and comfort, would appear to be capable of affording the best prospects. Of all the systems under consideration, the electric tramway has, with the latest developments, considerably decreased in capital expenditure.

The following are some of the advantages which may be claimed for placing tramways in a separate fenced portion of the highway:—

(1) Capital and maintenance expenditures are reduced by at least 50 per cent.
(2) Average speeds have been doubled.
(3) Earning capacity of cars increased.
(4) Accidents due to collision with other forms of transport unknown, with consequent saving in payments for claims.
(5) Safety of operation considerably increased in consequence.
(6) Maintenance of cars considerably decreased, due to operating on tracks entirely suitable to them.
(7) Equipment wear and tear reduced.
(8) Passengers carried more comfortably.
(9) Greater consideration for the amenities of frontagers considerably increased.
(10) Other traffic has greater freedom.

The last return issued by the Ministry of Transport shows that the capital expended on tramways in Great Britain amounts to nearly 86 million pounds, and the net receipts amount to 6.6 per cent. of this expenditure for that particular year. If tramways had been relieved of the expenditure in providing paving and foundations, the net receipts

would have shown an increase to 10.5 per cent. of the modified capital expenditure. Without waiting for legislation, tramway undertakings can themselves relieve the situation by the methods outlined.

If the same basis had been used, capital outlay could have been reduced, and even assuming that only 50 per cent. of the total route mileage had been so dealt with, the capital expenditure would be down to about 77¼ million pounds, working costs would have been considerably reduced, and on the assumption that gross receipts remained the same, net receipts would show an increase to 12.2 per cent. of the smaller capital outlay, apart from the time saved to passengers due to increased speed and other advantages already outlined.

Engineering features which have contributed to the success of the modern motor omnibus and other road vehicles (long and wide wheel bases, low loading lines, low steps, large road wheels, low tare ratio to total load, the use of special alloy-steels and metals to obtain the minimum weight for the maximum of strength, and even the use of resilient surfaces on the wheels) are all features which could, with decisive advantage, be incorporated in newer tramway developments.

The partially-enclosed surface tramway operating between stops or level crossings for the accommodation of other traffic, approximately ¼-mile apart, and yet attaining average speeds up to 20 miles per hour, is not the full measure of development for this system. The value of the additional land found necessary for such methods is not a serious matter, and if the very long view is taken in time, it will be prudent if ample land is reserved so that the obvious advantages of express and overtaking services invaluable in dealing with morning and evening rush-hour traffic could be given effect to, and the outermost areas developed and encouraged to the fullest possible extent.

It is not a very great step further if at least in the outer areas surface crossings are displaced by either overhead or subway methods. The free use of this method and the recognition in time of the necessity of its provision will give to electric tramways a further lease of life comparable to the last quarter of a century, and it will be difficult for any other system to vie with it in giving to the public a service replete with maximum benefits.

The extension of private right-of-way methods towards and through existing built-up and valuable areas of cities may call for other methods, but not more difficult or expensive than those with which railway authorities have to deal. But the experience and advantages obtained where land is cheap will play a very large part in inducing those responsible to recognise that ample width between building lines on main arteries of communication is more economical and more desirable than subterranean or elevated structures.

The Development of the Cooking Load.

At the monthly E.D.A. Salesmanship Conference on February 15th, Mr. R. A. Lower, sales engineer, Norwich Corporation Electricity Works, read a paper in which he related his experiences in installing electric cookers on the Norwich mains. The paper was written with the object of discussing how to set about the selling of electric cookers. Mr. Lower said that he had been trying to develop a cooking load in Norwich since 1912, but at first, like many others, he found that it was difficult work. Indeed, from 1912 to 1922 only 60 cookers were put on the mains. The present position appeared to offer bright prospects; during the past year some 456 cookers had been installed. Mr. Lower urged the need of a simple inclusive tariff, so that the prospective consumer could realise without effort at the outset exactly what annual expenditure he was embarking on. An inclusive rental of from 8s. 6d. to 12s. 6d. per quarter, according to the size and type of the cooker, was found to be satisfactory alike to the consumer and the undertaking, with energy at anything from 1d. to 1½d. per kWh. A cooker with boiling ring, combined boiling ring and grill, and small oven, could be supplied at 8s. 6d. per quarter, and a cooker with two boiling rings, grill and large oven, and plate rack, could be supplied at 12s. 6d. per quarter. In Norwich a popular arrangement was to offer a complete cooking installation at an extra ¼d. per kWh over and above the current charge, to include hire and wiring of cooker, maintenance, etc. Under this tariff a certain minimum consumption must be guaranteed by the consumer; this varied from 850 to 1,200 kWh according to the size and type of the domestic cooker. A certain number of consumers had demanded a slot meter, and it had been found a good idea to calibrate the meters at 1½d. per kWh, and to allow a rebate of 4d. in the shilling after a certain minimum number of shillings had been inserted.

Having put forward the right tariff, the ground should be prepared by advertising and circularising to get the "electric cooking idea" firmly before the public. In Norwich they advocated a cooker on a month's free trial, and the hope was expressed that some national advertising would be done by the E.D.A. The services of a lady demonstrator of the right personality, tactful, of good address, and able to accommodate herself to all classes was also urged. The possession of innumerable cooking diplomas was not regarded as of such great importance as the right personality and disposition. A showroom kitchen, resembling as closely as possible the perfect kitchen, must also be part of the scheme, and demonstrations to individual householders or two or three at a time were preferred at Norwich to demonstrations before a large audience. As the lady demonstrator would almost certainly bring in numbers of inquiries, not only for cookers but for other things, male representatives must also take part in the work; above all things they should be users of all electrical apparatus. Mr. Lower did not approve of the policy often suggested, of giving representatives of the undertaking special terms.

In some remarks upon methods of dealing with likely customers, Mr. Lower emphasised the need for bringing prominently to the public notice the advantages of cleanliness, efficiency, &c., of electric cooking and electrical apparatus generally, and every endeavour must be made to stamp out the idea that electric cookery was a costly experiment. Having secured an order, the best way to make the consumer satisfied was to standardise the cookers in possibly two or three sizes of one make; employ a lady demonstrator for keeping in touch with the users; employ suitable men for wiring and fixing; reduce maintenance arrangements to a fine art, and give real service; maintain the current supply; and secure the hearty co-operation of every department in the undertaking.

Mr. Lower was of the opinion that it was quite impossible for contractors to handle the electric cooking business satisfactorily. The great secret of success was stated to be "service," and the average contractor had neither the capital nor the facilities for giving this service after installation.

The last part of the paper dealt briefly with commercial cooking, as distinct from domestic cooking. After pointing out that the annual consumption per kilowatt of demand was very much greater with the commercial user than on the domestic side, Mr. Lower stated one or two examples in Norwich. In 1912 a large drapery establishment found, upon doctor's evidence, that its cook was being slowly poisoned by gas fumes, owing to the congested arrangement of gas cookers in the kitchen. This made an opportunity of introducing electric cooking, and 66 kW of apparatus was installed. This kitchen had ever since been cooking for a staff of about 200, providing about 120,000 luncheons and teas for an annual consumption of about 60,000 kWh. The cost of maintenance averaged from £10 to £12 per annum. Another interesting example in Norwich was an electrically equipped movable chip-potato stall. This stall cooked about 30 tons of potatoes annually, and had been doing so electrically for the last four years with eminently satisfactory results, involving a consumption of about 15,000 kWh per annum. In order to popularise this commercial section of electric cooking, it was desirable to offer hiring or hire-purchase facilities for the apparatus, and in the great majority of cases no difficulty was experienced if payments were spread over a period of, say, two or three years.

The capital outlay involved in the 456 domestic cookers installed in Norwich last year was £7,670, and these had displaced gas-cookers in over 90 per cent. of the cases. The consumption had been 586,500 kWh, and the revenue £2,443 at 1d. per kWh. The load was considered to be entirely "off peak," and consumption varied from 500 to over 3,000 kWh per annum. The rental revenue was not less than £714 per annum. These 456 cookers represented a connected load of 2,370 kW, and the estimated maximum load was about 500 kW. The over-all load factor was estimated at 15 per cent., and the demand factor at 20 per cent. It was estimated that the cooking energy in Norwich cost 0.55d. per kWh to supply, and careful figures of maintenance cost showed this to be 10s. 1.7d. per cooker per annum.

Discussion.

Alderman Mrs. HAMMER (Mayoress of Hackney) asked Mr. Lower how he would really begin the work of placing his first hundred cookers. Mr. Lower's figure of 12s. 6d. per quarter for the hire of cookers did not compare with the price of hiring gas stoves, and it would seem a good plan to bring the price down to that level.

Mr. S. C. HURRY (Jackson Electric Stove Co., Ltd.) complained that at a recent informal meeting the majority of the electrical people present did not seem to think that cookers were worth worrying about yet. Manufacturers suffered from the fact that supply people wanted to re-design their cookers, but he had noticed that they were nearly all supply people who had not had a lot of experience. Those who had 200 or 300 on their mains seemed content to believe that manufacturers really had gone into the matter deeply.

Mr. F. SELLEY (Marylebone) analysed the figures given by

Mr. Lower. The cost of the cookers was £7,670. Assuming that they had a life of 10 years, and taking repayment of loan and interest at 5 per cent., the amount repayable yearly was £993. Taking an average rental per cooker per year at £1 17s., he obtained £844. Maintenance, at 10s. 1.7d. per cooker per year was £341, leaving a profit on hiring of £503. There was over half a million kWh sold, yielding £2,443, the net profit being £1,099. Adding profit on hiring, and deducting the loan repayable, the net profit last year was £609. But the majority of the cookers had not been in service for a year, and it was reasonable to assume that in a full year the energy sold would amount to three-quarters of a million kWh. That would increase the efficiency of the station, and it seemed reasonable to assume that the cost of energy would be 0.45d. per kWh. Then, the net profit would be increased from £609 to £1,526. Development was reaching a point when it would not pay to put in installations for the small consumer. Figures relating to Marylebone were put in to show the value of the cooking load. Ten fairly large restaurants last year consumed 811,000 kWh; three small teashops consumed 46,000 kWh; four small nursing homes, 149,000 kWh; four small blocks of flats (between £150 and £200 a year), containing 347 consumers, not using electricity for cooking, only consumed 69,000 kWh. On the other hand, nine cookers had been installed in very small workmen's dwellings, and they consumed, last quarter, 2,558 kWh. In another small block of flats an installation was put in, there being a weekly charge which covered maintenance and the *ad lib.* use of electricity. Six irons used 266 kWh in three months.

Major F. H. MASTERS said he was troubled because the plea of those who were asked to use electricity for cooking was that, whilst it was convenient in every way, it was very expensive, but when he had talked the matter over with them he found that they had not the least idea what other forms of cooking cost. Therefore, salesmen would have to find some other standpoint on this question of cost than that of comparing it with that of other forms of cooking. He pleaded for more courage in pushing electric cooking, and the remarks of Mr. Lower and Mr. Selley showed that that courage was worth practising. Electricity had got to come, and if those extraordinarily retrograde gentlemen in some districts, who did not believe in electric cooking, failed to realise that, they would be made to—not by electrical engineers, but by the general public.

Mr. W. A. GILLOTT asked whether any of the cookers installed at Norwich were part of housing schemes, or whether they were assisted by any Council housing scheme. He also asked for the cost of selling a cooker—advertising, labour, and demonstration costs. He was advising an undertaking recently, where it was considered satisfactory if in the first year it sold 150 cookers, by the efforts of two salesmen, who cost £400 or £500. He advised his clients to be bold, and to spend a reasonable sum quickly. This was agreed to, and 70 individual cookers were sold in one day, whilst 150 were disposed of in three weeks. He also mentioned that 900 cookers were installed in Glasgow last year.

Mr. MORTON said that some means should be devised whereby contractors could do a large proportion of the work of the supply authorities in selling cookers.

Mr. SHEARS (Hackney) said that if manufacturers paid more attention to the efficiency of cookers, by having well-fitting doors, more efficient lagging, and so on, the question of residual heat would become very important.

Mr. J. W. BEAUCHAMP (Director of the E.D.A.) emphasised the value of the work done in Norwich. With regard to new housing schemes, he said a large number of small houses were being built, and were being placed in bad positions from the point of view of the supply engineer. If supply engineers took the view that they could not put cookers in these scattered houses, they would never get the lighting business either.

Mr. F. G. NESBITT emphasised the importance of remedying the disparity in the cost of hiring as between gas and electric cookers. If cookers could be hired at 2s. or 3s. per quarter, and the energy rates adjusted, the supply authority would not lose over the transaction.

Mr. G. L. GARTON (Ipswich) said that he had found the system of charging an extra ½d. per kWh for hire of apparatus, with a guarantee to use or pay for a certain consumption, was fatal.

The CHAIRMAN deplored the absence of managers of undertakings, which showed that the general run of managers had not yet realised the importance of this subject. The load was more important than the power and lighting load; there was no slump, resulting from strikes, &c. It would pay to give away cookers, so why worry about a rental of 10s. or 12s. a quarter? He deprecated the reduction of current costs to less than 1d. per kWh, that was low enough to beat any gas company in the country. The huge profit made on that basis could be spent on service, maintenance, and the subsidising of the cooker itself. It was much better to have a low hiring charge, however, than to add something to the price of energy to pay for the cooker.

Mr. LOWER said that the campaign at Norwich was started by personal introductions into well-known people's houses; those people had talked, and had advertised the cookers thereby. As to rentals of gas and electric cookers, the two were not comparable; people who used electric cookers knew they were worth more than gas cookers, and were prepared to pay for the extra value. As to the value of the domestic load, he said that in many towns half the network was not earning a penny for 18 hours out of 24, whereas if electric cookers were installed the network would earn money on and off all day, with very little extra outlay. In fact, in some cases where 9d. a kWh was charged for lighting, it might be costing 2s. In reply to Mr. Gillott, he said that none of the houses in which the cookers were installed at Norwich was built under a Council scheme. Contractors in Norwich did not take any interest in cookers, and he did not see how they could come into the business further than doing the wiring if they recommended an approved consumer. They could not give service, and without that the cooking business was absolutely useless. With regard to the extra ½d. per kWh, and a guaranteed consumption, in practice the consumers used more than the guaranteed minimum. The department re-wound elements, and if an element wanted re-winding it was replaced and brought back to the department for re-winding. He agreed that energy should not be cut down to less than 1d. per kWh.

The West Riding (Aire and Calder) Electricity District.

Electricity Commissioners' Second Inquiry.

(*Concluded from page* 313.)

ON the resumption of the inquiry, on February 14th, Sir John Snell presiding, Mr. A. T. MILLER, K.C., on behalf of the Conference Authorities, reported on the negotiations which had proceeded between representatives of the three main parties since the adjournment the previous day, and stated that whilst it was not possible to say that agreement had been completely secured, he believed the Leeds objection to its station being under the control of the Joint Authority had been settled. The Conference Authorities, whilst placing great importance on the inter-connection of stations, had not insisted on the joint control of the stations of the various undertakers in the district, and Leeds had agreed that the scheme should provide for the necessary co-ordination between the various inter-connected stations.—Sir JOHN SNELL remarked that the Commissioners would have to be satisfied that the solution provided a proper engineering and economic scheme.—Mr. MILLER said he believed the difficulty with the Power Company had not been finally solved, but there was every prospect that, given time, their object would be reached. He therefore applied for a further adjournment until the following day.

The representatives of the three chief parties then withdrew, and for about an hour representations were made on behalf of smaller authorities. Earby and Barnoldswick asked that their districts should be excluded from the Aire and Calder District and included in Lancashire, and Mr. GEORGE PARKER (Queensbury District Council) asked to be taken out of the reserved area "A" and to be left out of the list of authorities constituting the Joint Authority, feeling that Queensbury would be better served by supplies from the Electrical Distribution of Yorkshire, Ltd. They did not want to have to distribute supplies themselves.

Mr. E. P. CHAMBERS (clerk to Shelf District Council) also sought exclusion, and remarked that Shelf was even nearer than Queensbury to Hipperholme, where the company was already supplying.—Mr. J. A. BOWER (South Yorkshire Coal Trade Association and the Doncaster Collieries Association) said his clients preferred to see what became of the negotiations in progress. The West Yorkshire and South Yorkshire Coal Trades Associations wished for two representatives on the Authority, but as a last resort were prepared to accept one representative only for the two bodies.

The inquiry was then adjourned until February 15th. In the meantime protracted consultations proceeded between the representatives of the three principal parties and representatives of the Electrical Distribution of Yorkshire, Ltd., and some of the smaller authorities.

On February 15th the Commissioners sat only for an hour in the morning, and re-assembled in the afternoon, whilst the parties continued their negotiations in private.

The morning session was occupied chiefly by hearing the case for full representation on the Joint Authority of the London, Midland & Scottish Railway Co. and the London and North-Eastern Railway Co., Mr. ALFRED TYLER urging that the railway groups should each have one representative on the Engineers' Committee as well as on the Joint Authority.—The Commissioners came to a compromise by which representatives of the railway companies would have practically a right to be present, and would be summoned to attend when matters affecting them were discussed.

Mr. JOHN POLLITT (Bradford Chamber of Commerce) asked for representation of traders and consumers on the Joint Electricity Authority.

At the afternoon resumption, Mr. A. T. MILLER, K.C., reported a satisfactory outcome of the negotiations. On condition that the scheme proceeded, the Conference Authorities undertook not to oppose any application of the Company or order of the Commissioners for the added area—those portions of the North-east Midlands district which were within the Power Co.'s area, but outside the area of the Joint Authority, the added area to be added to the Aire and Calder District and to form part of the unreserved portion of the district, this undertaking not to prevent the Conference Authorities from taking steps to protect their interests in the matter of the constitution of the Joint Authority consequent on the addition of the added area. The second big point of agreement was as to meeting the Power Co.'s requirements with reference to some sort of guarantee that the bulk supply contract would be entered into. It had been met as follows:—"The authorised undertakers within the reserved area should enter into an agreement of guarantee with the Company, on a basis of each such undertaker assuming a liability for a proportion of the demand of the Joint Authority under the principal agreement, the amount of the guarantee of each said undertaker being based on the proportion borne by the number of kWh sold to the said undertaker during the year ending March 31st, 1923, in relation to the total number of kWh sold during the said period to all the said undertakers." A further point of agreement was that the Joint Authority's powers in the control of development and supply were limited to the reserved area "A," but the Joint Authority could act in an advisory capacity as to the whole district, including unreserved area "B."

The CHAIRMAN said he understood another clause in the agreement to mean that instead of the company submitting particulars direct to the Joint Authority, they should be submitted to the Commissioners, to be held, if the latter thought fit, at the disposal of the Joint Authority. Mr. MILLER replied that that was to avoid multiplication of particulars.

Mr. J. A. GREENE (for a number of local authorities) said it should be made clear in any order that as the local authorities in the unreserved area accepted the position of the Power Company, coming in and distributing power and light freely, the local authorities had the right to ask to become authorised distributors and to apply for a lighting order.

Mr. TYLER asked if the Joint Authority would, in the area in which it acted in an advisory capacity, be under obligation to give a supply if one were asked for.

The CHAIRMAN said the obligation would be on the Power Company.

Mr. MILLER said the agreements between the chief parties did not deprive Hebden Bridge from continuing to receive from Halifax and Halifax to supply. Hebden Bridge would also be at liberty to take bulk supplies from the Power Company instead. In area "B" powers and duties of generation and supply would be exercised by the company, so far as bulk supply was concerned, free from the competition of the Joint Authority or anybody else.—The CHAIRMAN said the clause would be all right to "joint authority," but the rest was *ultra vires*.—Sir H. HAWARD said that obviously it was the intention of the arrangement that the company should be free from competition by the Joint Authority, but it was another thing to put it into language consonant with the provisions of the Electricity Acts, 1919 and 1922. There was a declaration of intention in the Commissioners' scheme, but whether it could be carried further he did not know.—The CHAIRMAN remarked that the Commissioners could put into their order such points as were within their powers and supplementary powers would have to go into a Bill.

Discussion proceeded on the part of Mr. Harker, for the Power Company, as to the procedure to be adopted in relation to the making of the Commissioners' order and the passing of the agreed Bill.

Mr. WOOLL (Leeds Corporation) expressed appreciation of the terms on which the Power Company had undertaken to promote a Bill, to which Leeds attached great importance, without making any suggestion with regard to the distribution of the burden which that promotion would entail.

Mr. W. P. DONALD (Tadcaster Electrical Supply Co.) asked for exclusion from area "B," and remarked that the district was extraordinarily fortunate in having a cheaper supply than anything of equal volume in the country. It was entirely outside the area of the Power Company and he appealed on grounds of efficiency in the district and of isolation.—The CHAIRMAN said the Commissioners were not disposed to rule Tadcaster out of the district.

Representatives of various bodies addressed the Commissioners on the subject of representation of their interests on the Joint Authority, and the inquiry was then adjourned until February 16th.

When the inquiry was resumed, Sir J. SNELL, in bringing the proceedings to a close, remarked that it had been one of the most wearisome inquiries he had "ever had the honour to preside over." Most of the points, chiefly little legalities and the drafting of clauses still in question, were left to be settled before the Commissioners in London at a later date.

Mr. J. E. LIGHTBURN (West Riding County Council) asked for similar protection for that body as that given hitherto.

Mr. A. T. MILLER, K.C. (Conference Authorities) submitted a document representing a new 3rd Annex which had been agreed to by the three chief parties, and on which the Chairman said the Commissioners had no observations to make. It dealt with the bulk supply contract between the Power Co. and the Joint Electricity Authority within the reserved area, to be taken in successive amounts of not less than 5,000 kVA after notice by the Authority to the company, the first 5,000 kVA to be taken within eighteen months of the Bill receiving Royal Assent, or within such extended period as the Commissioners might approve, and the whole 20,000 kVA to be ready within seven years from the first supply. Each 5,000 kVA to be utilised for a period of fifteen years at a yearly load factor of not less than 25 per cent. from the date when such amount was taken and the number of kWh corresponding thereto to be paid for whether taken or not. The load factor to be based on (*a*) the kVA provided; (*b*) the hours during which the supply was available in each year; and (*c*) the kWh sent out from the station for such supply. The company would provide and lay two 0.25-sq. in. underground mains from the Ferrybridge generating station to the agreed point of supply at the boundary of the reserved area, with all necessary protective and control apparatus along the route, or routes. Contingencies with regard to plant and supply were covered by the Annex, together with a provision that the power factor of the supply should be maintained at not less than approximately 0.8 under normal conditions of working, and the company was to charge the Joint Authority an annual 5 per cent. on the capital expenditure incurred by the company (including an allowance for interest during construction) in providing the transmission mains. There would also be a second annual charge of interest at 8 per cent. and a contribution to a sinking fund—deemed to accumulate at 5 per cent. based on 30 years for land and buildings, 20 years for plant, and 25 years for mains—allowed by the Commissioners for repayment of the capital expenditure per kVA of plant installed, multiplied by the amount of power which at the time the company was under obligation to supply.

Sir JOHN SNELL, after some discussion, said the Commissioners were prepared to undertake the settling of penalty clauses if agreement were not reached by the parties.

Mr. FRANK BEVERLEY (Pudsey Corporation) had no objection to entering into a form of guarantee with the company eventually if the Commissioners thought it desirable. The Corporation was desirous of retaining its own rights within the borough of Pudsey, but it was not hostile to the scheme. It was now agreed that the works of the Power Co. within the borough of Pudsey should be taken over by the Electrical Distribution of Yorkshire, Ltd., which would continue to supply direct those consumers for whom that arrangement existed. From the appointed day the Corporation would supply existing and all new power consumers up to 15 h.p., but the Distribution Co. would supply new power users requiring over 15 h.p., the Corporation to have the right to purchase the undertaking in Pudsey at any time within 42 years of the operation of the order. The Corporation and the Distribution Co. would take from the Joint Electricity Authority all the energy they required for use within the borough of Pudsey. Pudsey Corporation leased its tramways to Leeds Corporation and desired to retain the right to lease them as it thought fit.

Mr. HARKER said Hemsworth Rural Council was in area "B" and wished to take a supply from some other source than the bulk supply company, which, suggested Mr. Harker, would cut right across one of the main principles of the settlement already agreed, and Hemsworth must expect strenuous opposition when it made its application for distributing powers before the Commissioners.

Mr. PERKINS held that the Hemsworth application was unreasonable.

Mr. MILLER intimated that difficulty with respect to Morley had been overcome.

Sir JOHN SNELL, in bringing the proceedings to a close, said that the Commissioners would give effect to the agreement between the principal parties by an amending order which would be submitted for confirmation to the Minister. If it was necessary that there should be a supplemental Bill to deal with matters which were outside the powers of the Commissioners, the Bill and the Order would advance together.

Filamentless Valves.—In the last few months there have been several promising attempts to solve the problem of filamentless valves. The latest takes the name of the "S" tube, after its inventor, Mr. C. G. Smith, an American, and consists of two carbon electrodes enclosed in a glass bulb into which helium gas is pumped. These valves have been applied to the rectification of alternating current with very successful results, says the *Daily Mail*.

West of Scotland Electricity District.

Proposed Reorganisation Scheme.

IN pursuance of the provisional delimitation by the Electricity Commissioners of the above-named district*, the Commissioners are to hold their first local inquiry with respect thereto in Glasgow on March 11th next to consider, *inter alia*, a scheme that has been submitted by a Conference of Local Authorities, Authorised Undertakers, and others within the district for the formation of an Electricity Advisory Board for the area.

There are 17 generating stations within the area, 10 of them being municipal and seven company owned. The existing underground interconnecting lines are that owned by the Clyde Valley Electrical Power Co. between Clyde's Mill and Yoker (15.4 miles), consisting of a 0.2 sq.-in., 33,000-volt, 15,000-kVA cable; and that belonging to the Glasgow Corporation between Port Dundas and Pinkston (1.5 miles), consisting of two 0.2 sq. in., 6,600-volt, 5,400-kVA cables, with one 0.2 sq. in. 6,600-volt, 2,700-kVA tapping taken off the 0.4 split conductor cable between Port Dundas and the Springburn sub-station, which is looped into Pinkston.

The coal consumption in the district in 1920-21 totalled 1,338,041,060 lb., producing 416,981,117 kWh (delivered), or an average of 3.21 lb. per kWh; the best figure being 1.84 lb. at Dalmarnock, followed by 2.54 lb. at Clyde's Mill, the worst being 15.9 lb. at Kilmacolm. The total cost per kWh delivered for the month of December, 1922, varied from 0.183d. at Kilmarnock to 0.252d. at Glasgow (for two stations, or 0.218d. at Dalmarnock) and 0.311d. in the Clyde Valley (for three stations, or 0.238d. at Clyde's Mill), the highest figure being 2.883d. at Skelmorlie. In 1920-21 the various undertakers had a total maximum demand of 204,802 kVA, their plant capacity being 346,002 kVA; the Clyde Valley Co. having a maximum demand of 59,400 kVA and a plant capacity of 109,000 kVA, while the Glasgow Corporation had a maximum demand of 85,000 kVA and plant capacity of 95,000 kVA.

It is pointed out in the scheme that, if the various generating stations were developed individually in order to accommodate the anticipated demand, in 1927-28 the estimated total coal consumption would be 1,431,263,000 lb., producing 714,819,690 kWh (delivered), or 2 lb. per kWh; in 1932-33 the figures would be respectively 1,839,524,500 lb. and 956,333,850 kWh, or 1.92 lb. per kWh. According to the statistics furnished by the undertakers, the estimated maximum demand in 1927-28 would total 266,640 kW, and in 1932-33 it would reach 348,250 kW.

The capital outlay which would be involved in the provision at each individual undertaking of the plant necessary to meet the anticipated demand, including 25 per cent. reserve in each undertaking and the cost of additional transmission lines and switchgear for interconnection which would be required if development proceeded on an individual basis, would in 1927-28 total £1,226,000 (£52,000 for transmission lines and switchgear), the cost per kW at the various stations varying from £8 at Clyde's Mill to £12 at Dalmarnock and £42 at Ayr, the last being a hydro-electric scheme. In 1932-33 the figures would be a total of £1,015,900 (£53,400 for transmission lines and switchgear), the cost per kW varying from £9 at Dalmarnock to £12.35 at Clyde's Mill.

In order that development may proceed under the scheme up to and including 1932-33, it is proposed to utilise nine existing generating stations and extend five of them as indicated in Table I.

Stations.	Extensions, kW.	Plant capacity, kW. 1927-28.	1932-33.
Yoker, Clyde Valley E.P. Co. ...	1— 20 000 sets	55,750	55 750
Cambuslang (Clyde's Mill), Clyde Valley E.P. Co....	2— 20,000 sets	51.250	71 250
Motherwell, Clyde Valley E.P. Co	—	20.500	20.500
Dalmarnock, Glasgow Corp. ...	4— 18.750 sets	131.250	168,750
Port-Dundas, Glasgow Corp. ...	—	23,000	23,000
Pinkston, Glasgow Corp. Trams.	—	29,500	29,500
Dellingburn, Greenock Corp. ...	1— 5,000 sets 1— 10.000 sets	25,000	35,000
Kilmarnock Ayrshire Joint Board	2— 12,500 sets	35,000	47.500
Paisley Corporation	—	6,300	6,300
Totals...	11—175.500	377,550	457,550

In order to distribute bulk supplies it will be necessary prior to and during 1927-28, and between that year and 1932-33, to construct seven underground and three overhead transmission lines, varying in length from 0.043 mile to 11 miles and in capacity from 6,000 to 19,750 kVA, the pressures to be employed being 22,000, 20,000, and 11,000 volts.

The estimated capital outlay which will be involved in the scheme will be in 1927-28 for generating plant, &c., £944,000; main transmission lines, £126,960; feeders, £101,860, plus £53,180 additional outlay on individual development and £5,318 interest, &c., thereon. In 1932-33 the figures will be for generating plant £884,500; main transmission lines, £91,700; feeders, £14,880, plus £65,420 and £6,542. At the first period it is estimated that under the scheme there will be an annual saving on coal consumption of 8,684 tons (£7,507) and on capital outlay of £53,180, or a net total of £12,825. At the second period the figures will be respectively 9,941 tons (£15,348) and £78,000, or a net annual total of £23,148, in addition to operating labour cost reductions.

It is suggested that the standard type of generation shall be three-phase alternating current, and the standard frequency (*a*) in the northern part of the district within the areas of the Glasgow Corporation and of the Clyde Valley Co., excluding the parishes of Erskine, Houston, Kilmacolm, Kilbarchan, Lochwinnoch, and part of the parish of Neilston, 25 cycles per second, and (*b*) in the remaining part of the district, including the burghs of Greenock, Port Glasgow, and Gourock, the parishes of Erskine, Houston, Kilmacolm, Lochwinnoch, Kilbarchan, and part of the parish of Neilston, the burgh of Paisley, and the whole of the county of Ayr, including the burghs therein, 50 cycles per second. For transmission, the standard pressures (between phases) will be, in the case of main lines, 33,000 volts and 22,000 volts, and in the case of secondary lines, 11,000 volts, 6,600 volts, and 3,300 volts.

The Motherwell, Port Dundas, Pinkston, and Paisley stations will for some years to come be run in conjunction with the main stations, and while they will not be extended, it may be that more modern plant will be installed in some of them. The remaining eight stations will be shut down, while Dalmarnock, the Clyde's Mill, and Yoker stations will be interconnected. The Greenock and Kilmarnock stations will also be inter-connected in Paisley's power station, while the Ayrshire Electricity Joint Board will develop the whole of the county of Ayr. A new station, situated probably on the sea front, is in contemplation and will be constructed when necessary; furthermore, the waters of Loch Doon will be utilised when the Ayrshire Joint Electricity Board finds it economical and useful to do so.

Fig. 1.—West of Scotland Electricity District.

The requirements of the 50-cycle and 25-cycle areas will, in course of time, involve the erection of new generating stations. The only existing generating stations used solely for tramways are (*a*) Pinkston belonging to Glasgow Corporation, and (*b*) the station at Motherwell of the Lanarkshire Tramways Co. At the latter generation will cease, and it is strongly recommended that generation by the two departments of Glasgow Corporation should be unified.

The only practical scheme devised for the utilisation of waste heat is that of a 1,000-kW installation at Greenock in connection with waste heat from a sugar refinery. Proposals to utilise the upper reaches of the River Clyde, up to an approximate maximum continuous output, under conditions of minimum water flow, of 6,000 kW, have been put forward by promoters representing the ground proprietors in the area around the Falls of Clyde. Preliminary negotiations have been opened between the Clyde Valley Electrical Power Co. and the promoters with a view to giving a supply into the eastern area of the Power Co.'s network.

* ELEC. REV., January 6th, 1922.

The scheme provides for the establishment of the West of Scotland Electricity Advisory Board to consist of 21 members appointed as follows:—Three by the Glasgow Corporation, three by the Clyde Valley Electrical Power Co. and the Strathclyde Electricity Supply Co., Ltd. (jointly), two by the Ayrshire Electricity Board, and one each by the town councils of Dumbarton, Greenock, Hamilton, Motherwell and Wishaw, Paisley, and the county councils of Dumbarton, Lanark, Renfrew, and Stirling; one each by the London, Midland & Scottish and the London and North-Eastern Railway Companys, and one jointly by the Electric Supply Corporation (Dumbarton), Kilmacolm Electric Lighting Co., Ltd., Lanarkshire Tramways Co., and the Skelmorlie Electric Supply Co., Ltd. Provision is also made for the constitution of an Engineering Committee, consisting of the chief electrical engineers for the time being of the Glasgow Corporation, Clyde Valley E.P. Co., Ayrshire Electricity Board, and the Greenock Corporation, to advise and assist the Board.

In conclusion, it should be explained that the "County of Ayr" refers to the whole county, and that the following parishes have been included additional to the area (see accompanying map) provisionally determined by the Electricity Commissioners:—Auchlinleck, Ballantrae, Barr, Colmonell, Dailly, Dalmellington, Girvan, Kirkmichael, Kirkoswald, Maybole, Muirkirk, New Cummock, Old Cummock, Sorn, and Straiton.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Underwood's Hinged Gallery.

The advantages of the simple device (Patent No. 22,672/23) shown in the accompanying illustration (fig. 1) are so apparent and fill such a long-felt want that they hardly need comment. Instead of holding shades, globes, &c., upon the points of three screws (often badly adjusted and causing breakage from expansion of glass, or loosening from vibration or corrosion and letting the globe fall), MESSRS. UNDERWOODS (MANCHESTER), LTD., of 53, Brown Street, Manchester, have patented

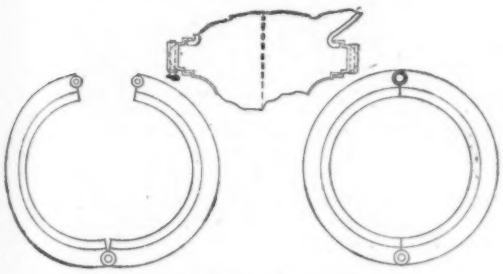


Fig. 1.—The Underwood Hinged Gallery.

and put on the market this gallery which, whilst it fits firmly all round the lip of the glass, leaves sufficient play for any slight variation either from expansion or in manufacture. This type of gallery can be adapted to all types of fittings. Another feature is that the globe is easily removed for cleaning.

"Speedwell" Fuseboards.

MESSRS. J. H. TUCKER & CO., LTD., King's Road, Tyseley, Birmingham, draw our attention to their introduction of a new range of fuseboards designed to facilitate wiring. There have been two types of boards hitherto on the market specially intended for this purpose, viz., those of the "swing back" type and those of the "detachable back" type. The principal faults of the "swing back" type are that whilst the length of wire for the circuits near the hinged side of the board has to be necessarily short, that at the other end has to be unduly long to allow the board to open to its full extent, resulting in superfluous wire; and

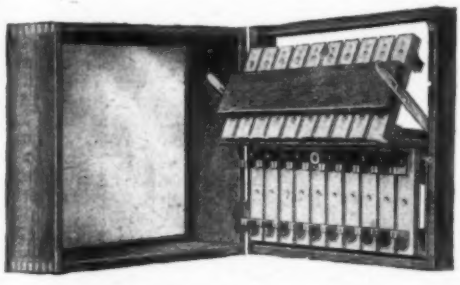


Fig. 2.—A "Speedwell" Fuseboard.

the form of construction is not suitable for large boards (which most require easy wiring facilities) on account of the weight thrown on the hinges. The "detachable batten" type also has many disadvantages. In the "Speedwell" range, one of which is illustrated in fig. 2, the length of wire to be left for each circuit is uniform, reasonably short, and easily accommodated. The battens are not detachable, but they can be moved into any convenient position, leaving both the hands of the wireman entirely free to do the wiring. The battens are mounted in a swing saddle pivoted, by means of screws, at the bottom. The screws which hold the batten in the saddle are in slots, which permits the batten to be moved up and down or turned into any position for wiring. The method of construction is suitable for "large way" boards, which require some form of easy wiring facilities much more than "small way" boards. "Speedwell" boards are at present available only in the 5-amp. size and in teak cases. The bases and fuse handles are of the highest grade English vitreous porcelain. The cases are of teak throughout, including the battens (not, as in many cases, whitewood with a teak front mould) and polished (not varnished), and with dovetailed corners. The swinging frame is of electro-tinned wrought iron.

A Gearless Portable Drill.

It is claimed for a three-phase portable drill made by the HURST ELECTRICAL PLANT, LTD., Belfast, that it "stands up" to the severest work, even when continually and purposely pulled up. The machine, which is illustrated in fig. 3, is absolutely gearless, the drill being fixed directly into the motor spindle. The a.c. construction does away with the commutator and brush gear, which are often a source of trouble in d.c. drills. The stator winding is very robust, while the rotor is practically indestructible. The motor runs in ball bearings. Two side handles are provided, as well as a combined spade and breast handle. The drill is started and stopped by means of a 3-pole double-break switch enclosed in a metal cover,

Fig. 3.—A Gearless Portable Drill.

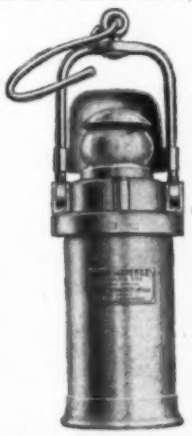


Fig. 4.—Pillarless Lamp fitted with a "Dioptric" Well-Glass.

which is fitted with a gland to take any pull on the cable. The casing and end frames are of aluminium, and the drill complete weighs only 27 lb. The diameter is 7 in., and the overall length 7¼ in. A larger size weighing 40 lb. is made. The machine takes drills up to ½ in. diameter; the larger size accommodates drills up to ⅝ in. diameter.

New Well Glass for Miners' Lamps.

One of the most serious of the many dangers to which mine workers are exposed is nystagmus, a painful disease of the eyes which is primarily due, it has been ascertained, to inadequate illumination. Concentrated and undiffused light is a potent cause of the ailment, but necessarily the filament of a miner's electric lamp must be short. The use of larger lamps is barred by the fact that the limit of weight has been reached, and also by the fact that a brilliancy beyond certain limits is harmful.

To obtain increased illumination with lower source brilliancy, the THOR ELECTRIC SAFETY LAMP CO., LTD., Birmingham, has produced the "Dioptric" well-glass. To obtain increased illumination a dioptric system of lenses was introduced into the glass cover of the lamp, the object being to

direct all the available luminous energy into the direction in which it was required. This resulted in from five to seven times more illumination, but the brilliancy of the source remained the same. In order to reduce the brilliancy of the source it was necessary to increase its area. To this some of the increased efficiency had to be sacrificed. The final result is claimed by the company to be a light source having approximately the low brilliancy of a flame, the power in the direction required being twice that of the lamp as generally used, or even more. This has been verified by independent tests conducted by experts. The accompanying illustration (fig. 4) shows the well glass as applied to a "Thor" pillarless-type lamp.

An Electrical Wash Boiler.

Mr. BARNES KAY, 247, Blackburn Road, Haslingden, nr. Manchester (resident electrical engineer and tramway manager to Haslingden Corporation), has designed an electrically-heated wash boiler of 7-gal. capacity, fitted with elements of 3 kW. The outer case contains an inner shell, and the space between the two shells is packed with heat-resisting material. The water container is loose, and can be lifted out after use for cleaning purposes. The heating elements are not in any way connected to the water container, but are

Fig. 5.—An Electrical Wash Boiler.

fixed underneath to a separate base; the heating effect is all round the container, as well as at the bottom. The boiler has a three-heat control, and the "low" heat is sufficient to keep water at boiling temperature.

Fig. 5 shows the water container removed out of the shell, and there are two hand grips inside the boiler for convenience of lifting out; the container is fitted with a condenser on top.

A number of these boilers have been on the Haslingden Corporation mains for over twelve months, and the income from them is on an average one shilling per week, with electricity at 1½d. per kWh. Arrangements have been made to turn them out in quantities to meet the demand for a simple and inexpensive wash boiler.

The Institution of Electrical Engineers.

Annual Dinner.

THE annual dinner of the Institution of Electrical Engineers was held at the Hotel Cecil on the 21st inst., Dr. Alexander Russell, president, being in the chair, supported by vice-presidents and members of the I.E.E. Council. Covers were laid for some 520 diners, and the company included a number of distinguished guests, amongst them being some of H.M. Ministers, representatives of the Church, law, Government Departments, Universities, engineering and scientific societies, &c. Following the loyal toasts, the chairman read congratulatory telegrams that had been received from the French Society of Electricians, the American Institute of Electrical Engineers, and the Italian Electrotechnical Association.

VISCOUNT CHELMSFORD, First Lord of the Admiralty, was then called upon to toast the "Institution of Electrical Engineers," and in doing so he congratulated the president upon having been elected to a Fellowship of the Royal Society. That, he thought, in these days of depreciated honours was one of the greatest honours that could be aspired to by an Englishman. The speaker went on to point out that a modern warship without electricity was almost inconceivable; in the Air Service radio-telephony and telegraphy were of far greater importance than the aircraft itself, and submarine boats would be useless without batteries. The Navy, therefore, recognised its indebtedness to electrical engineers for much of its efficiency.

DR. ALEXANDER RUSSELL, M.A., D.Sc., F.R.S., president, in responding to the toast, said he was grateful to Lord Chelmsford for having spoken so kindly of their Institution and industry. He was a minister who had filled the highest offices of State with distinction and universal acceptance. The activities of the Research Department of the Admiralty were reflected in the equipment of their latest vessels. They had proved that science was a weapon of greater potential value than weight of broadsides, and some of the activities of that department would prove of value to the mercantile marine; for instance, the radio-acoustic method of locating the position of a ship at sea and communicating the result to the ship in a few minutes. He hoped that some of the younger radio engineers would turn their attention from devising new methods of broadcast reception to navigational problems which were in urgent need of solution. He felt that it was within their power to evolve means whereby a seaman would be enabled to determine his position at sea quickly and easily.

The work of the I.E.E. overlapped that of many other institutions; they were always willing to help and co-operate with other societies, and to him it was an especial pleasure that on March 21st the Physical Society of London would celebrate its jubilee in the I.E.E. As electricians they remembered that the first polyphase motor was shown in action at a meeting of that Society in June, 1879. The greater help which both that Society and the American Physical Society were giving in the production of the physics section of *Science Abstracts* was gladly welcomed; one of the first fruits of that closer co-operation was that the deficit on that account last year was wiped out, and they looked forward to greatly extending the usefulness of that publication.

They were at the beginning of an almost miraculous linking-up of the whole world by the electrical reproduction of sound, and on the eve of practical applications of radio broadcasting in their schools. Mr. W. E. Highfield's "transverter" should prove of great value in long-distance electric traction; at present the railways were consuming unnecessarily some six million tons of coal per annum.

The past year could be looked at with complacency by the electricity supply industry; the National Association of Supervising Electricians had the names of only three unemployed members in its books, while, luckily for manufacturers, existing plant was always depreciating, but they recognised that constant improvement was necessary.

It was of vital importance to the nation that every schoolboy who showed an inventive turn of mind should be encouraged to follow his bent, even if that involved very early specialisation. Many had been prevented from specialising at an early age by the necessity of passing many examinations, and, in his opinion, the training requisite for passing examinations did not encourage the inventive faculty. The loss to the nation when inventive genius was prevented from developing was a grievous one.

MR. F. GILL proposed the toast of "Our Guests" in a delightfully humorous manner, and SIR W. CLARK, controller of the Overseas Trade Department, responded in the absence of Mr. W. Lunn, Parliamentary Secretary to that Department, whose presence was necessary in the House of Commons. He said that they could all pay splendid testimony to the fine work done by the Institution. The trade outlook was better than it had been this time last year. He thought their difficulties would be overcome and they could look forward to the future with confidence.

SIR E. RUTHERFORD, F.R.S., president of the British Association, also responded to the toast. He said that the I.E.E. was governed with much wisdom and was doing admirable work. He sometimes flattered himself that he was an embryo electrical engineer. The atom was one of the finest pieces of machinery that existed; one part of it had been extracted, and he was now engaged upon an attempt to extract another, about which he hoped to say more on another occasion. He pointed out the value of pure science in engineering and the importance of the application of physics to electrical engineering; they could help the engineer, and the latter helped them in return by the provision of instruments without which such work as he undertook could not be carried out. He hoped that engineers, in their prosperity, would not forget their poor relatives—those long-haired professors to whom engineers owed their living.

COL. R. E. B. CROMPTON (who remarked that he had so much work to do that he hardly found time to go to bed) and DR. S. Z DE FERRANTI (who expressed his deep appreciation of the honour done him by the bestowal of the Faraday medal) also spoke briefly, after which the company adjourned to the Victoria Hall for the reunion. A programme of music was performed during the evening by the British Imperial Orchestra, conducted by Mr. Arthur Crudge, and the "Public Address" system of loud speakers was again made use of in order to render the speeches audible to all in the banqueting hall.

Parliamentary.

[By Our Special Parliamentary Reporter.]

Locomotives for India.—On February 18th, in reply to questions, Mr. R. RICHARDS, Under Secretary for India, dealing with the purchase of locomotives for India, said that the purchase of stores for the Indian Government was no longer undertaken by the India Office. Such purchases were made by the High Commissioner for India, who was directly responsible to the Government of India, and in accordance with resolutions adopted by both Chambers of the Indian Legislature and accepted by the Government of India these purchases were in the interests of the Indian taxpayer, made in the best market. The High Commissioner, under his instructions, followed the ordinary business principle of accepting the lowest satisfactory tender, regard being paid to quality, reliability, inspection facilities, and promptness of delivery. He had ascertained from the High Commissioner that an order for five locomotives had recently been placed with a German firm, the lowest British tender being about 25 per cent. higher than that accepted. He was also informed that as a matter of fact British manufacturers were, under the competitive conditions laid down, able to secure the great bulk of the orders placed. The Secretary of State for India did not consider that it would be equitable to limit the discretion of the Government of India in this matter, either by an amendment of the East India Loans Act or otherwise. During the last two years only a very small proportion of the orders for material required by the Indian State Railways had been placed on the Continent.

British Empire Exhibition.—On February 19th, Mr. LUNN informed Mr. Hogge that the total expenditure to date in connection with the participation of His Majesty's Government in the British Empire Exhibition was £67,868.

Rural Telephones.—On February 19th, Mr. HARTSHORN, the Postmaster-General, informed Mr. Foot that from May 1st to December 31st last 264 rural exchanges with 3,365 subscribers were opened. During the same period 496 call offices were added to the system in rural areas, and 1,038 additional rural party line stations were installed. There was a total increase of 6,902 in the number of subscribers to rural exchanges between June 30th and December 31st last.

The Marconi Contract.—On February 19th, Mr. BECKER asked if the Government had granted any monopoly to the Marconi Company in connection with the Empire wireless chain.

Mr. HARTSHORN said that the answer was in the negative, nor had any sole licence been given to this company. The whole subject was now under the consideration of a Committee, which had been asked to submit a report at the earliest possible moment.

Railway Works.—On February 19th, Mr. CHARLETON asked the Minister of Transport how many applications by railway companies had been made for permission to proceed with works under the extension of powers provided by the Railways (Authorisation of Works) Act, 1923.

Mr. H. GOSLING said that one such application had been formally lodged. This was made by the Southern Railway Company on December 27th last, and was at present under consideration. The estimated expense of carrying out the works proposed was £416,115.

River Severn Scheme.—On February 19th, Mr. SIDNEY WEBB, President of the Board of Trade, informed Mr. Miles that the question of utilising the tides for power purposes was considered carefully by the Water Power Resources Committee with particular reference to the Severn. The Committee decided that further investigation of a number of physical and technical questions was necessary before a final conclusion could be made as to the practicability, from a commercial standpoint, of generating power from the tides. The preliminary investigations required would necessarily extend over a considerable period, and the scheme, even if it were ultimately found to be practicable, was therefore not one which could be utilised to reduce unemployment existing at present or in the near future.

Trade Facilities.—On February 19th, Mr. W. GRAHAM, Financial Secretary to the Treasury, moved a resolution providing on behalf of the Government an additional guarantee of £15,000,000 under the Trade Facilities Act.

In the debate which followed, Mr. COMYNS CARR complained that great schemes of hydro-electric and railway development had been held up because private individuals and not the State owned these undertakings.

Mr. HANNON complained of the holding up of schemes of railway electrification. A few years ago he said an elaborate report was made on the importance of carrying out the electrification of the main line to Brighton. It was shown that there would be an immense saving in the working expenses of the line, that the transport capacity of the line would be enormously increased, and that it would be a great advantage, from the point of view of the public as well as the railways, that the scheme should be carried out. But nothing had been done. In the neighbourhood of Liverpool Street there was the possibility of a large scheme of electrification, and on the North-Eastern Railway between Newcastle and York prospects for electrification had been under consideration. All these schemes could only be carried out by some extension of public credit within limitations which would safeguard the taxpayer.

Mr. W. GRAHAM, in reply, pointed out that considerable measures of assistance by way of guarantee had already been given to railway enterprise. There were two schemes, the City & South London, which had been assisted with a guarantee covering £6,500,000, and the South-Eastern and Chatham Railway, which had been assisted with a guarantee of £5,500,000. There were, of course, other schemes under consideration. Under the Railway Act of 1921, however, a sum of £51,000,000 was provided in respect of war-time agreements, and that had contributed in no mean way to the strong position of the railway undertakings. It was, therefore, only fair to expect them to do a great deal without coming under the Trade Facilities scheme.

The resolution was agreed to.

Poplar Electricity Department.—On February 20th, in reply to Mr. Ayles, Mr. H. GOSLING said that he had no information officially as to the minimum wages paid to labourers in Poplar. It appeared, however, from figures published in the technical Press, that the wage cost of production per unit sold in 1922-23 was lower in Poplar than in any other municipal or company station in London. The prices charged per unit could not be exactly compared owing to the variety of the tariffs; but the average price obtained by Poplar per unit was lower than that of any other undertaking (municipal or company) in London.

Bulk Electrical Power.—Major MOULTON asked the Minister of Transport whether he had considered the advantages to be gained from bulk generation of electrical power near the sources of coal supply and the distribution of such power over a wide area of the Kingdom; and whether the Government proposed to take any action towards initiating a scheme or schemes for this purpose.

Mr. H. GOSLING said that the reorganisation of electricity supply in different parts of the country in accordance with the policy laid down in the Electricity (Supply) Acts of 1919 and 1922 had followed the broad lines indicated in the question. The technical schemes approved by the Electricity Commissioners for various electricity districts involved bulk generation in a limited number of well-placed stations, the interconnection of such stations, and the distribution of electricity from such interconnected systems throughout each electricity district. With regard to the location of large stations for bulk generation, other important factors besides that of proximity to coal-pits had to be considered in order to secure cheap generation, *e.g.*, the availability of abundant natural supplies of condensing water and the distance from the load to be supplied.

Private Bills.—The following private Bills have been read a first time in the House of Commons:—The Ashton-under-Lyne Corporation Bill ("to provide for the running of trolley vehicles between the boroughs of Ashton-under-Lyne and Oldham, and to extend the area of supply of the Ashton-under-Lyne Corporation for electricity purposes"); the Central London & Metropolitan District Railway Companies Bill ("for empowering the Central London Railway Company to construct subways and works; and to confer further powers on that company and on the Metropolitan District Railway Company, the London Electric Railway Company, and the Southern Railway Company"); the Croydon Corporation Bill ("to authorise the execution of street works and to provide and work trolley vehicles and omnibuses, and to make further provision with regard to the tramway undertaking of the Corporation"); the Great Western Railway (Additional Powers) Bill; the Halifax Corporation Bill ("to confer further powers on the Corporation of Halifax with respect to its water and electricity undertakings"); the London & North-Eastern Railway Bill; the London County Council (General Powers) Bill; the London, Midland & Scottish Railway Bill; the London United Tramways Bill ("to authorise the London United Tramways, Ltd., to run services of trolley vehicles"); the Rawtenstall Corporation Bill ("to make further provision with regard to the tramways and electricity undertakings of the Corporation"); the Rotherham Corporation Bill ("to confer further powers on the Corporation for the running of trolley vehicles and omnibuses; and to enlarge its powers with regard to its tramway, gas, electricity and water undertakings"); the Southern Railway Bill; and the Tynemouth Corporation Bill ("to confer further powers on the Corporation with respect to its electricity and other undertakings.")

North London Traffic Facilities.—*The Times* states that Lord Ednam, Mr. William Henderson, and other members representing Middlesex constituencies have put down a blocking motion against the London & North-Eastern Railway Bill, and they desire to move a new clause repealing the clause in the Great Northern Railway Act (No. 2) of 1902, which prevents the construction of a tube railway north of Finsbury Park. A deputation recently waited upon the railway authorities to see whether there was any hope of an extension of the tube railway beyond Finsbury Park in the near future, but were unable to obtain any definite information. The tube railway authorities say that it is no use producing a scheme as the London & North-Eastern Railway will veto it under its powers. The London & North-Eastern Railway, on the other hand, states that it must see the proposal before it decides whether to veto it or not, and the result is a deadlock which Middlesex members are anxious to discuss in the House of Commons.

Special Orders.—Special Orders made by the Electricity Commissioners and confirmed by the Minister of Transport for the following districts have been approved:—Burley-in-Wharfedale; Wellingborough and Bedford; Newmill (Yorks.); Gildersome, &c. (Yorks.); Paisley, &c.; Heysham; Dalziel, &c. (Lanark); Bothwell, &c. (Lanark); Port Talbot; Wellingborough; Henley & Wokingham; Glasgow, &c.; Market Harborough, Wellingborough, &c.; Seaton (Devon), &c.; Feltham and Sunbury-on-Thames; Horwich (Lancs.); Llangennech, &c. (Llanelly); Saffron Walden (Essex); Guisely & Yeadon (Yorks.); Billingham (Durham); Billericay, &c., (Essex); Cranbrook (Kent); Axbridge and Long Ashton (Somerset); Sherborne (Dorset); Chadderton (Lancs.); Malmesbury (Wilts.); Wantage (Berks.); Tiverton (Devon); and Redcar (Yorks.).

Legal.

An Electrician's Claim.

IN the Mayor's and City of London Court on February 19th, before Mr. Registrar Dell, a claim was made by Mr. A. E. C. Teesdale, Eastcheap, E.C., against Mr. Louis Nelson, Crouch End, cartage contractor, for £8 10s. 10d., the price of accumulators supplied to the defendant and work done by the plaintiff to the defendant's trap in fitting up electric light in place of the ordinary trap lights. Mr. C. J. Pack, solicitor, represented the defendant.

The defendant admitted that the work was done, but stated that it was a liability of the company of which both he and his brothers were at the time directors. Mr. A. E. WESTON, who was secretary of the company at the time the order was given, stated that the defendant had admitted several times to him that it was his debt, and Mr. HYMAN HARRIS, who had been horsekeeper in the company's service, corroborated, and further evidence in support of the claim was given by plaintiff's brother. The REGISTRAR pointed out that if he accepted the argument of the defendant's solicitor he should have to hold, in effect, that the plaintiff and his witnesses had conspired together to defeat the ends of justice. A tradesman looked for payment to the individual who placed the order with him. Judgment was given for the plaintiff, with costs.

Griffith & Co. v. Stepney Borough Council.

IN the King's Bench Division, on February 21st, Mr. Justice Bailhache heard a claim by Messrs. Griffith & Co., for damages against the Stepney Borough Council for injury to a barge. Their case was that they received an order to deliver coal to the Council's electricity works. A barge loaded with coal was sent to the defendants' wharf, and had to be tied up for a night, during which a passing steamer caused a swell which swamped and sank the barge. The coal was washed off and remained in the river bed, but the barge was raised. Another of plaintiffs' barges, laden with coal, was sent and moored in the same place. When the tide went out the barge settled on the heap of coal which had been washed from the first barge and was seriously damaged. His Lordship, in giving judgment for plaintiffs for £300 damages and £76 demurrage, said that it was the duty of the defendants to see that barges moored to their wharf were not in danger. The coal agents' contract did not bind the owners of the barge, and the latter had received a direct invitation to send their barge to the wharf.

Thefts of Electricity.

No fewer than twelve cases of faudulent consumption of electricity were brought to light on February 19th, when the Abertillery Council prosecuted a number of persons.

In the first case, that of Mary Ann Turnell, an inspector said that he found that the mechanism of the prepayment meter on defendant's premises had been tampered with, enabling electricity to be obtained without payment. A fine of 20s. was imposed. Six of the other eleven cases were of a similar nature, and the same fine was inflicted in each case, one case was adjourned, and the rest dismissed.

On February 14, Matthew Shepphard was prosecuted by the Hull Corporation for the fraudulent consumption of electricity. It was stated that defendant had a bakehouse to which power only was supplied. An inspector found an electric lamp being used in the bakehouse, and reported the matter. It was found that a connection for the lamp had been made at an inspection box.

Defendant was fined £10 and costs or, in default, three months' imprisonment.

The Charge Against H. H. Oxley.

AT Bow Street, on February 22nd, H. H. Oxley, electrical engineer, was charged on remand with obtaining credit without disclosing that he was an undischarged bankrupt. According to the *Leeds Mercury*, Mr. C. A. Searle, private secretary to Sir Trevor Dawson, vice-chairman and managing director of Vickers, Ltd., said that Sir Trevor had never corresponded with Oxley regarding any proposed amalgamation of Vickers, Ltd., and Matthews & Yates, nor had he, as represented by Oxley, deposited £1,000 in a joint account with Oxley. F. H. Hutchins, a skilled labourer, of Gravesend, gave evidence as to investing £525, all the money he possessed, in schemes put before him by Oxley. He raised a portion of the amount by mortgaging his house. Hutchins added that he was now out of employment, and drawing the dole. A further remand was ordered.

Published Specifications.

Compiled expressly for this journal by MESSRS. SEFTON-JONES, O'DELL AND STEPHENS, Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1922.

1,592. "Apparatus for determining dielectric strength." A. W. Empson. January 18th, 1922. (210,110.)

9,291. "Electric incandescent lamps." H. Fletcher. November 2nd, 1922. (210,289.)

20,460. "Protection of alternating electric current systems." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. July 26th, 1922. (Cognate application 22,573/22.) (210,294.)

26,424. "Oscillating electric fans." A. H. Railing and A. E. Angold. September 30th, 1922. (210,476.)

26,734. "Variable-frequency alternating-current generators." N. Japolsky and M. Kostenko. October 3rd, 1922. (210,482.)

26,866. "Telephone systems." Automatic Telephone Manufacturing Co., Ltd. January 27th, 1922. (Patent of addition not granted.) (192,362.)

28,422. "Electric kettle." C. de C. Matulich. October 19th, 1922. (210,489.)

28,423. "Crystal rectifiers for wireless telegraphy." L. B. Miller. July 17th, 1923. (210,490.)

28,989. "Torsional suspension for quick-period sensitive instruments, such as galvanometers, electrometers, and the like." F. A. Lindemann. October 25th, 1922. (210,492.)

29,270. "Electrical heating apparatus for use with fans." H. H. Grundy. October 26th, 1922. (210,497.)

29,514. "Electric vacuum tubes." Siemens & Halske Akt. Ges. October 29th, 1921. (187,992.)

29,580. "Variable resistance unit." W. J. Cameron. October 30th, 1922. (210,506.)

29,583. "Electric glow-lamp holders and the like." H. C. Tudor. October 30th, 1922. (210,507.)

29,617. "Magneto-electric handlamps." G. I. Johnson. October 30th, 1922. (210,509.)

29,641. "Variable inductances." British Thomson-Houston Co., Ltd., and R. C. Clinker. October 30th, 1922. (210,510.)

29,805. "Electric time-fuses for blasting, and process for the manufacture thereof." W. Eschbach. October 31st, 1922. (210,518.)

29,882. "Electric propulsion of ships." British Thomson-Houston Co., Ltd., and A. A. Pollock. November 1st, 1922. (210,524.)

29,883. "Electric propulsion of ships. British Thomson-Houston Co., Ltd., and A. A. Pollock. November 1st, 1922. (210,525.)

29,899. "Head-lights on vehicles and apparatus for use in connection therewith." J. Robinson. November 1st, 1922. (210,528.)

29,909. "Magneto-electric machines." R. B. North and A. Massey-Allen. November 1st, 1922. (210,529.)

30,147. "Colour control systems for projectors." British Thomson-Houston Co., Ltd., and H. C. Wheat. November 3rd, 1922. (210,537.)

30,148. "Suspension devices for electric lamps." British Thomson-Houston Co., Ltd., and F. M. Cocksedge. November 3rd, 1922. (210,538.)

30,821. "Electric ship propulsion systems and apparatus therefor." British Thomson-Houston Co., Ltd., and G. O. Watson. November 10th, 1922. (210,552.)

33,035. "Variable electric condensers." A. F. Pfeiffer. December 4th, 1922. (210,577.)

33,702. "Magneto-electric generators." Dr. G. E. Bairsto. December 8th, 1922. (210,582.)

34,046. "Remote-control of electrically-actuated apparatus." B. H. Peter, L. H. Peter, and Westinghouse Brake & Saxby Signal Co., Ltd. December 13th, 1922. (210,586.)

34,747. "Galvanic batteries." Oldham & Son, Ltd., and W. D. Wilde. December 20th, 1922. (210,593.)

1923.

102. "Private-branch exchanges." Western Electric Co., Ltd. (G. Deakin). January 2nd, 1923. (210,601.)

605. "Light-reactive cells." T. W. Case. January 8th, 1923. (210,604.)

1,703. "Upward-current classifiers." R. Minikin. January 19th, 1923. (210,613.)

5,711. "Illuminating devices." British Thomson-Houston Co., Ltd. (General Electric Co.). February 27th, 1923. (210,643.)

5,984. "Electric heating apparatus." J. Lightfoot. March 1st, 1923. (210,646.)

6,241. "Telephone systems employing automatic switching apparatus." Western Electric Co., Ltd. March 3rd, 1922. (194,313.)

7,961. "Electric furnaces." L. W. Wild and E. P. Barfield. March 20th, 1923. (210,652.)

8,432. "Process of coating particularly applicable to the coating of filamentary material, such as the filaments of vacuum tubes." Western Electric Co., Ltd. (Western Electric Co., Inc.). March 23rd, 1923. (210,654.)

9,400. "Electrically and thermostatically controlled apparatus." Aktiebolaget Birka Regulator. April 6th, 1922. (195,974.)

10,882. "Insulating cap for electrical cable joint." F. M. van Geldoren. April 21st, 1923. (210,668.)

11,026. "Variable grid leaks for use in connection with radio apparatus." H. A. Gaydon. April 23rd, 1923. (210,670.)

16,135. "Device for testing electric safety fuses." J. Bär. September 14th, 1922. (204,015.)

19,952. "Electric batteries." D. Pepper. August 7th, 1922. (201,933.)

21,195. "Apparatus for striking the arc in electric arc welding." Akt. Ges. Brown, Boveri et Cie. August 28th, 1922. (202,991.)

29,567. "Art of electro-plating." C. Foerster. November 23rd, 1922. (207,544.)

A New Electric Commercial Vehicle.—We learn that the British Electric Vehicles, Ltd., of Churchtown Works, Southport, is shortly putting on the market a new electric industrial vehicle designed to carry loads up to 2 tons, and to be capable of journeys of from 30 to 40 miles on one charge of the battery.